ME-7627
RESERVE

INSTRUCTION MANUAL

EMR 4180
HIGH-FREQUENCY
DISCRIMINATOR
(REVISION C)

SANGAMO WESTON
Schlumberger

EMR TELEMETRY

MP MASTER
MA20092

ME-7427

INSTRUCTION MANUAL

EMR 4180
HIGH-FREQUENCY
DISCRIMINATOR
(REVISION C)

Revision B November, 1969
Revision C October, 1977

SANGAMO WESTON
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EMR TELEMETRY

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AUGUST 1977

MANUAL CHANGE NOTICE #1

UNIT: EMR MODEL 4180 HIGH FREQUENCY DISCRIMINATOR

DESCRIPTION: Under paragraph 3.2, Operation, change page 3-2 as follows:

(1) Change step (e) to read "Select the Linear (L) output at the OUTPUT switch for the particular application.

(2) Add step (g) as follows:
"(g) Apply normally deviated signal and select linear (L) or shaped (S) at the output. The required data should be observed at the output."

NOTICE

IN THE EVENT THIS EQUIPMENT MUST BE RETURNED TO EMR FOR ANY REASON, SPECIAL CARE MUST BE EXERCISED IN PACKAGING FOR SHIPMENT. CARTON WITHIN A CARTON TYPE PACKING, WITH FOAM SUPPORT AND SEPARATORS IS RECOMMENDED TO PREVENT SHIPPING DAMAGE. SHOULD ANY INFORMATION BE REQUIRED REGARDING PACKAGING OF EMR EQUIPMENT, CONTACT EMR-TELEMETRY, SARASOTA, FLORIDA.

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Page No.	Rev. Letter
* Title	B
i thru iii	A
1-1 thru 1-5	Basic
* 2-1	B
2-2	A
* 2-3	B
2-4	Basic
3-1 and 3-2	Basic
* 3-3	B
3-4 and 3-5	Basic
4-1 thru 4-6	Basic
5-1 thru 5-7	Basic
5-8 and 5-9	A
5-10 thru 5-16	Basic
* 5-17	B
5-18	Basic
* 5-19 and 5-20	B
5-21	Basic
5-22	A
5-23 and 5-24	Basic
6-1 thru 6-10	A
* 6-11	B
6-12 and 6-13	A
* 6-14	B
6-15 thru 6-18	A
* 6-19	B
6-20 thru 6-25	A
* 6-26 thru 6-29	B

* The asterisk indicates pages that changed in the current revision.

TABLE OF CONTENTS

SECTION		PAGE
1	GENERAL DESCRIPTION	1-1
	1.1 Introduction	1-1
	1.2 Functional Description	1-1
	1.3 Physical Description	1-3
	1.4 System Application	1-3
2	SPECIFICATIONS	2-1
	2.1 General	2-1
	2.2 Electrical Specifications	2-1
	2.2.1 Input Characteristics	2-1
	2.2.2 Linear Output Characteristics	2-1
	2.2.3 Shaped Output Characteristics	2-2
	2.2.4 Tape-Speed Compensation	2-2
	2.2.5 Line Voltage Sensitivity	2-2
	2.2.6 Operating Power Requirements	2-3
	2.3 Mechanical Specifications	2-3
	2.4 Environmental Specifications	2-3
3	INSTALLATION AND OPERATION	3-1
	3.1 Installation	3-1
	3.2 Operation	3-1
4	THEORY OF OPERATION	4-1
	4.1 General	4-1
	4.2 Bandpass Input Filter (BPIF)	4-1
	4.3 Limiter Circuit	4-1
	4.4 Detector Circuit	4-3
	4.5 Output Filter	4-4
	4.6 Output Circuits	4-4
	4.7 Power Supply and Regulator Circuits	4-5
5	MAINTENANCE	5-1
	5.1 General	5-1
	5.2 Maintenance Guide	5-1
	5.2.1 Inspection	5-1
	5.2.2 Troubleshooting Guide	5-2
	5.3 Adjustment Information	5-9
	5.4 Drawings	5-9

TABLE OF CONTENTS (CONT'D.)

SECTION			PAGE
6	PARTS LISTS AND RECOMMENDED SPARES		6-1
	6.1	General	6-1
	6.2	Parts Lists Description	6-1
	6.3	Recommended Spares	6-2
	6.4	Provisioning Considerations	6-2
	6.5	Ordering Instructions	6-3

LIST OF ILLUSTRATIONS

FIGURE		PAGE
1-1	EMR 4180 Block Diagram	1-2
1-2	EMR 4180 Assembly Diagram	1-4
1-3	Typical System Application	1-5
3-1	EMR 4180 External Electrical Connections	3-3
3-2	EMR 4180 Operating Components	3-4
4-1	EMR 4180 Detailed Block Diagram	4-2
4-2	Power Supply and Regulator Block Diagram	4-6
5-1	Input Filter Card Waveforms	5-6
5-2	Discriminator Card Waveforms	5-7

LIST OF TABLES

TABLE NO.		PAGE
2-1	Model Number Identification	2-4
3-1	Function of Controls and Monitor Jacks, 4180 High-Frequency Discriminator	3-5
5-1	EMR 4180 Power Supply/Regulator Transistor Voltages	5-3
5-2	Input Filter Card Transistor Voltages	5-4
5-3	Discriminator Card Transistor Voltages	5-8
5-4	EMR 4180 Drawings	5-10
6-1	Parts List Breakdown	6-4
6-2	Recommended Spares List	6-25
6-3	Vendor List	6-26
6-4	Customer Provisioning Questionnaire	6-29

SECTION 1

GENERAL DESCRIPTION

1.1 INTRODUCTION

This manual contains information describing the EMR 4180 High-Frequency Discriminator. Included in this information are a functional and physical description, system application, specifications, installation and operation, theory of operation, maintenance data, and replaceable and spare parts lists.

1.2 FUNCTIONAL DESCRIPTION

The 4180 is a solid-state FM discriminator designed for use in a data reduction system to detect intelligence information contained in a subcarrier channel. Operation on any single subcarrier frequency in the range of 10 KHz through 24 MHz with deviations of ±4% to ±40% and intelligence output frequencies from DC through 5 MHz is available.

The particular subcarrier channel parameters of the discriminator are established by the channel selector and output filter. An identifier on the front panel illustrates the parameters of the unit. Two types of data outputs are available in the unit, linear or shaped. The linear output is provided for use when the intelligence information in the subcarrier channel is an analog-type data signal. The shaped output is provided for use when the intelligence information in the subcarrier channel is a pulse-type data signal.

An overall block diagram of the 4180 is shown in Figure 1-1. For a detailed block diagram and theory discussion, refer to Section 4.

A bandpass input filter (BPIF) at the discriminator input selects the desired subcarrier channel from the FM multiplex input. This signal is then limited and amplified by a current limiter and phase-splitting network.

A pulse-averaging-type FM detector is employed for detection of the intelligence in the subcarrier channel. The detection process is essentially that of measuring the average energy in a pulse stream generated in the detector circuit. The pulse stream generated is constructed internally at twice the repetition rate of the subcarrier input to the unit.

The output filter is a lowpass network which attenuates the twice-subcarrier rate pulses and supplies an output representative of the modulation in the subcarrier channel. Two types of output filter response characteristics are available, constant delay and constant amplitude. The response characteristic is a built-in function of the output filter and is provided as specified by the customer.

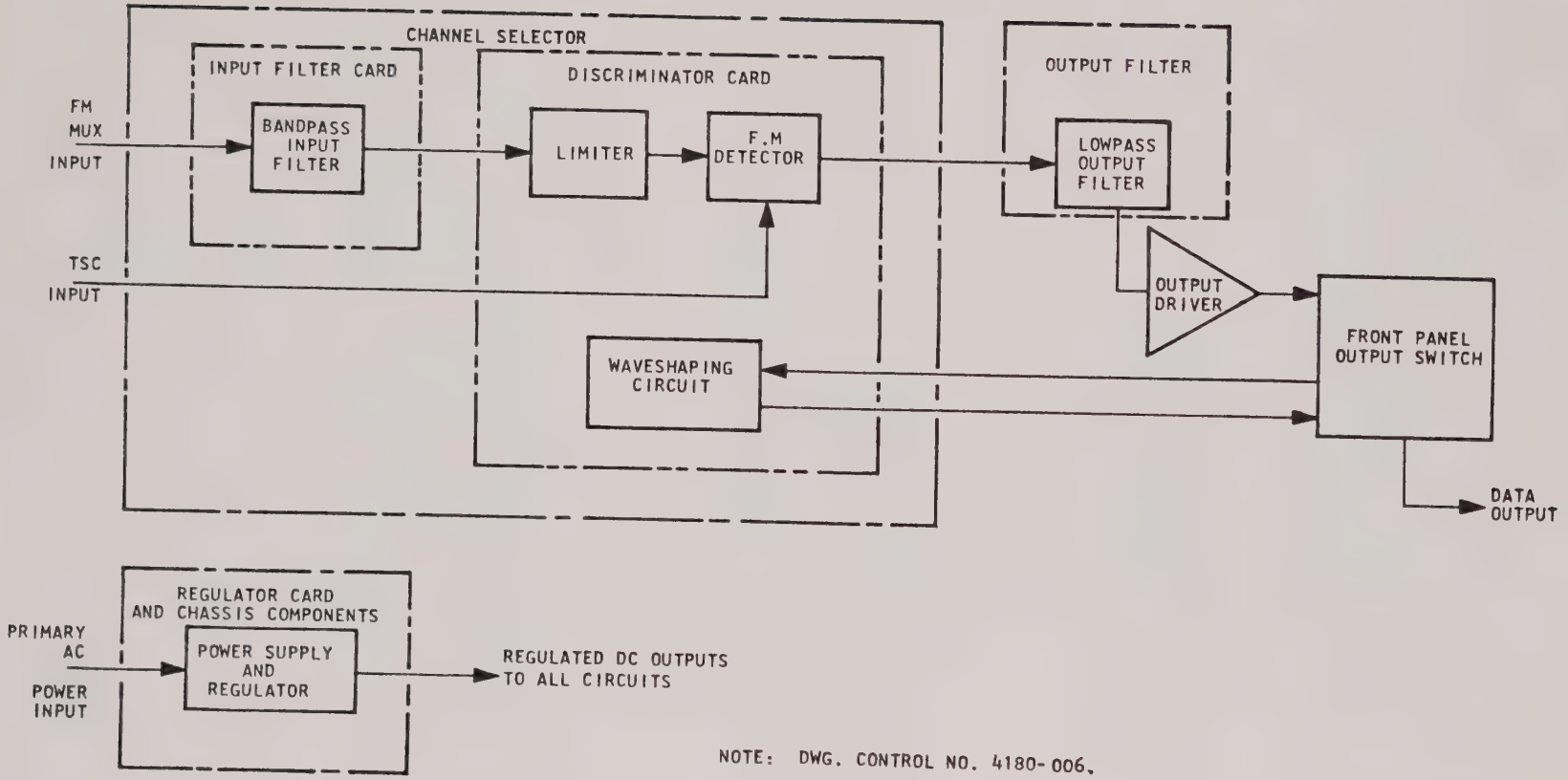


Figure 1-1. EMR 4180 Block Diagram

The resultant modulation voltage is then routed through an output driver to the front panel output select switch. This switch either routes the data signal to the data output or to a shaping circuit. If the data is an analog-type signal, the switch should be positioned to linear and the data signal is routed directly to the data output. However, if the data is a pulse-type signal, the switch may be positioned to shape and the data signal is shaped by a shaping circuit. This limiter type circuit improves the rise and fall times of the pulse signal. The resultant signal is then routed back through the output select switch to the data output.

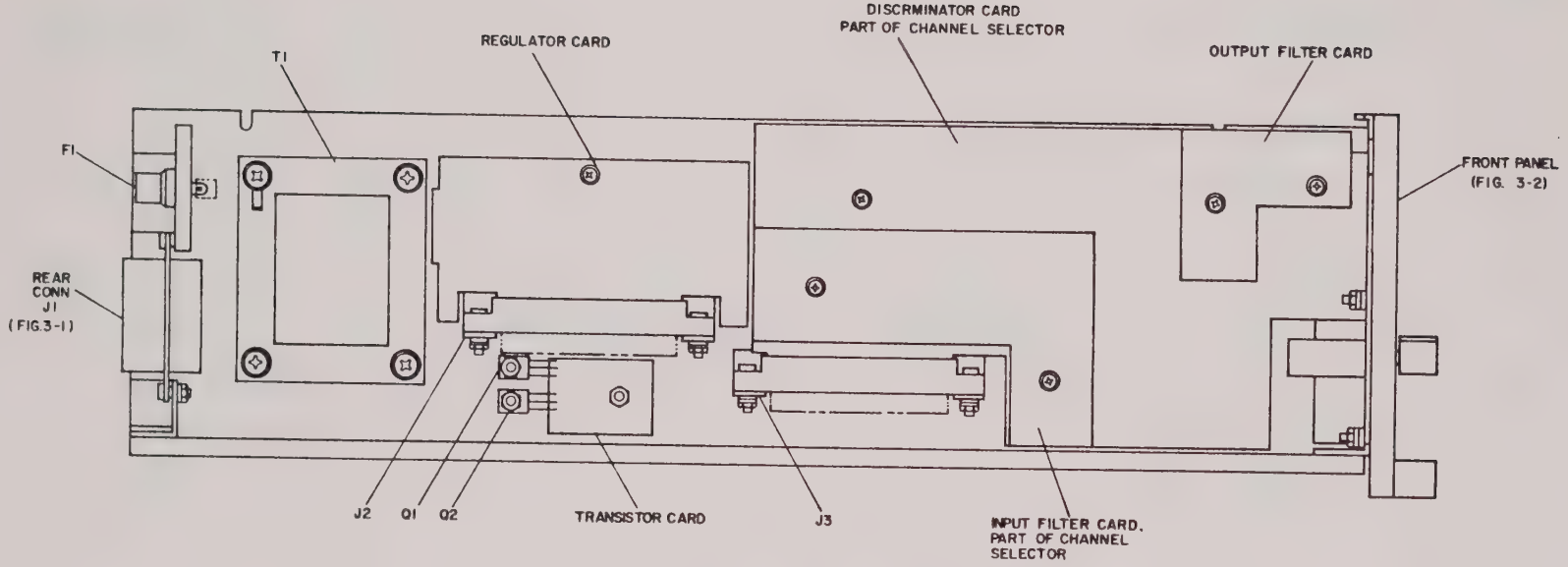
A power supply and regulator which operates from a primary AC power input is supplied to generate all regulated voltages necessary for discriminator operation. Several power supply configurations are available for operation from various primary AC power sources. These configurations are identified in Section 2 of this manual.

1.3 PHYSICAL DESCRIPTION

The 4180 is a component of the EMR 4000-series modular equipment line. The 4180 is designed for mounting in an EMR 4005 Rack Adapter. Overall dimensions of the 4180 are listed in the mechanical specifications in Section 2 of this manual. Included in the 4180 are a channel selector, an output filter, and a power supply and regulator. The channel selector, output filter, and regulator are contained on plug-in type cards which mount in the 4180. These cards and other major components of the 4180 are illustrated in the top assembly diagram, Figure 1-2.

1.4 SYSTEM APPLICATION

The 4180 is a part of the EMR High-Frequency ground based FM equipment line. Associated high-frequency units include the EMR 4580 VCO and the EMR 4880 Mixer Amplifier. These units may be combined to form a data acquisition/record system and a playback data reduction system or may be used for real time data acquisition and reduction. A typical system configuration is shown in Figure 1-3. Coupling between the data acquisition and data reduction systems is typically via a magnetic tape, RF link, or a line driving network.



NOTE: EMR DWG. CONTROL NO. 4180-001.

Figure 1-2. EMR 4180 Assembly Diagram

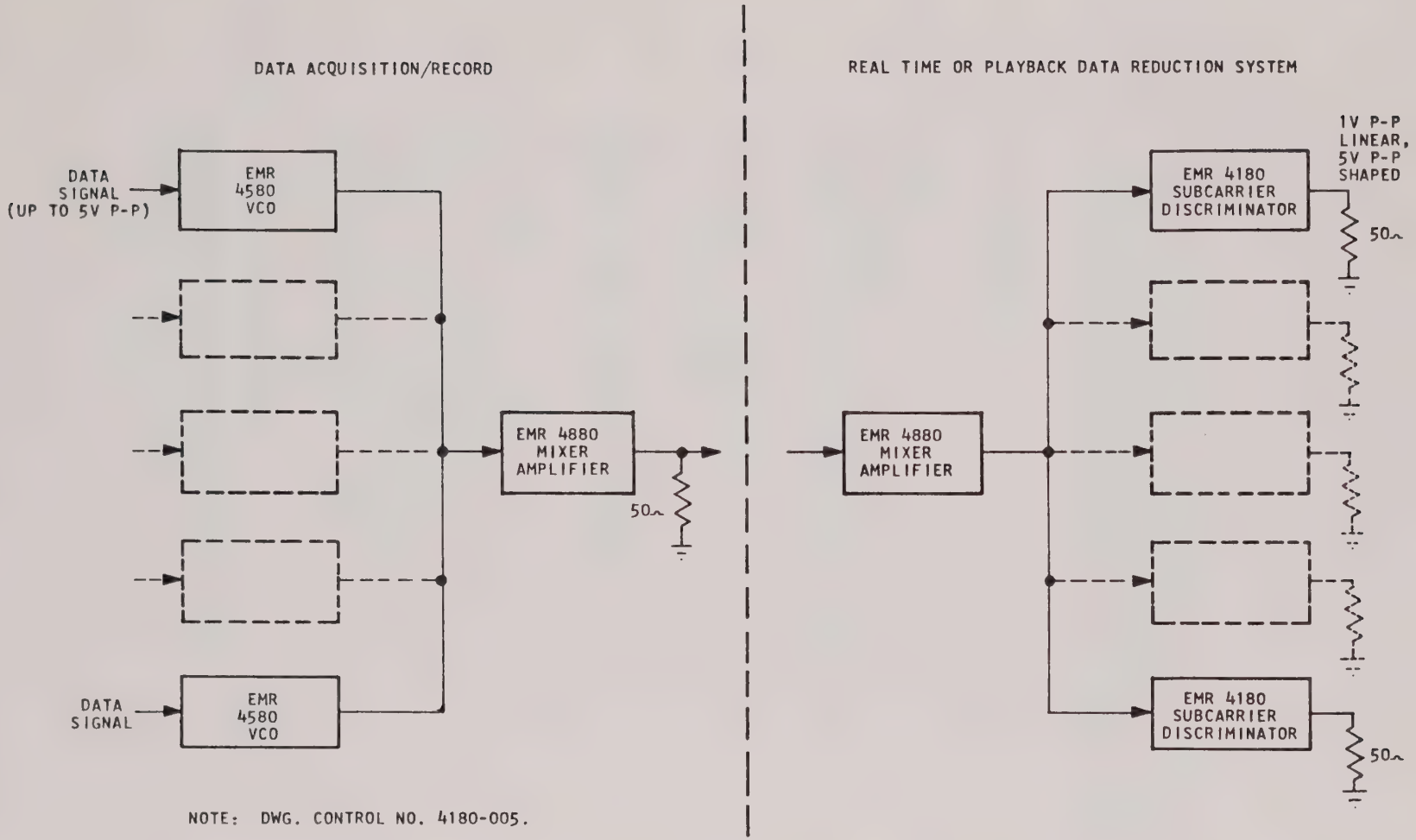


Figure 1-3. Typical System Application

SECTION 2

SPECIFICATIONS

2.1 GENERAL

This section contains the electrical, mechanical, and environmental specifications for the EMR 4180 High-Frequency Discriminator. These specifications are outlined in paragraphs 2.2, 2.3, and 2.4, respectively. Also included in this section is the 4180 model number identification which identifies the digits of the 4180 model number. This information is contained in Table 2-1.

2.2 ELECTRICAL SPECIFICATIONS

2.2.1 Input Characteristics

a. Input Impedance: Termination of 1K ±10% is standard. Other terminations within the range of 51 ohms through 1K may be obtained on special order.

b. Input Signal Amplitude: 20 millivolts through 2 volts peak-to-peak.

c. Center Frequencies: 10 kHz through 24 MHz (maximum upper bandedge frequency is 25 MHz).

d. Deviations: ±4% through ±40%.

e. Amplitude Modulation Rejection: With a deviation ratio of 2 or greater, a 6 db step in input signal amplitude anywhere in the dynamic input signal range will cause a peak transient at the data output of no more than 2% of bandwidth.

2.2.2 Linear Output Characteristics

a. Amplitude: Adjustable up to 2 volts peak-to-peak into an open circuit or up to 1 volt peak-to-peak into a 50-ohm load.

b. Deviation Sense: Positive.

c. Offset: The output may be offset up to 0.5 volt peak into a 50-ohm load.

d. Current: 10 milliamperes maximum. A short circuit at the output will not damage the unit.

e. Zero Instability: Not more than ±0.1% of center frequency for a 15-hour period after a 30-minute warm-up. Drift will be no more than ±0.1% of center frequency per degree centigrade.

f. Data Response: Selected by plug-in output filter. Constant amplitude or constant delay characteristic with 30 Db/octave asymptotic rolloff beyond cutoff. Cutoff frequencies of 1 KHz through 5 MHz are standard.

g. Output Noise (RMS): Not more than 0.2% of full bandwidth at a deviation ratio of two or greater.

h. Harmonic Distortion: For a deviation ratio of 2 or greater and with bandedge-to-bandedge modulation, the harmonic distortion will not be more than 2% for any modulating frequency up to channel cutoff.

i. Static Nonlinearity: Not more than ±0.2% of full bandwidth best straight line.

2.2.3 Shaped Output Characteristics

The shaped output is a 5-volt peak-to-peak squarewave (into a 50-ohm load) for deviations greater than 10% full-bandwidth and data frequencies up to channel cutoff.

2.2.4 Tape-Speed Compensation

The wow and flutter improvement will not be less than 20 Db for tape-speed variations as large as 3% and flutter frequencies up to the channel cutoff at a deviation ratio of 2 or greater, or 20 KHz, whichever is less.

2.2.5 Line Voltage Sensitivity

A 10-volt change in line voltage within the range of 105 to 132 volts causes a change in output voltage of not more than ±0.1% of full-bandwidth.

2.2.6 Operating Power Requirements

A power supply and regulator is included in the 4180. Power supplies are available for operation from various primary AC power sources. (See Table 2-1.)

2.3 MECHANICAL SPECIFICATIONS

a. Height: 5.25 inches (13.3 Cm).

b. Width: 1.22 inches (3.09 Cm).

c. Depth: 16-3/4 inches (41.94 Cm) from rear of front panel to rear of chassis.

d. Weight: Net, 3 pounds (1.4 Kg); shipping, 5 pounds (2.27 Kg).

e. Panel Finish: Either a combination of light and dark green semigloss baked enamel with white lettering or solid gray semigloss synthetic baked enamel with black lettering is standard. Other color schemes are available on special order. (See Table 2-1.)

f. Mounting: Designed for mounting in an EMR 4005 Rack Adapter.

2.4 ENVIRONMENTAL SPECIFICATIONS

a. Spatial Orientation: Designed for, but not limited to, horizontal plane mounting and operation.

b. Operating Temperature: +10°C to +50°C, circulating air.

c. Storage Temperature: −55°C to +85°C.

d. Altitude: 0 to 15,000 feet.

e. Relative Humidity: 5% to 95%.

Table 2-1. Model Number Identification

a	b	c	d	e	f	g
4180 - XX	- X	- XXXXX.XXX	- XXXX.XXX	- XXXXXXX.X	- X	-X

a. Design Sequence:

01 -- Standard

b. Power Input:

0 -- 105 to 132 volts RMS, 47-65 Hz
7 -- 105 to 132 volts RMS, 360-440 Hz
8 -- 230 volts RMS ±10%, 47-63 Hz
9 -- Special

c. Center frequency expressed in 8-digit KHz.

d. Deviation expressed in 7-digit KHz for constant-bandwidth or 7-digit % for porportional bandwidth.

e. Output filter data cutoff frequency expressed in 8-digit Hz.

f. Output Filter Characteristic:

1 -- Constant delay (CD)
2 -- Constant amplitude (CA)
9 -- Special

g. Paint:

1 -- Light Green 00048W*
2 -- Dark Green 00049W*
4 -- Gray 26492B*
9 -- Special

* W or B following paint color number indicates white or black panel lettering.

SECTION 3

INSTALLATION AND OPERATION

3.1 INSTALLATION

The 4180 High-Frequency Discriminator is shipped completely assembled and is ready for mounting. Any shortage or damage to the unit should be reported in accordance with the instructions contained in the EMR Purchase Order Acknowledgment (POA).

The 4180 is a modular unit designed for mounting in an EMR Model 4005 Rack Adapter. The modular unit is positioned on T-rails on the bottom surface of the rack adapter interior and is inserted into the mounting location. A push-to-lock knob on the front panel is depressed securing the unit in the mounting location of the rack adapter. The unit rear connector J1 mates with a receptacle in the rack adapter interior completing the electrical connections.

Information illustrating the position of the unit in the rack adapter and internal wiring of the rack adapter is contained in the EMR Model 4005 Rack Adapter Instruction Manual. The 4180 rear connector J1 and the external connections terminated at J1 are illustrated in Figure 3-1.

Internal cooling for the 4180 is provided by a blower mounted vertically on the rack adapter rear panel.

3.2 OPERATION

The operating controls and monitor jacks used in the operation of the 4180 are shown in Figure 3-2 and described in Table 3-1. All unit operation is performed via the front panel controls. The following steps are provided to assist the operator in the setup and operation of the unit.

a. Ascertain all input and output connections are terminated at the rear connector.

b. Ascertain the proper AC source voltage is provided for the unit. (See Table 2-1.)

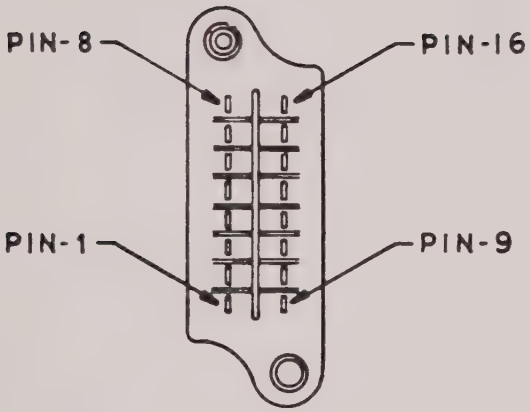
c. Terminate subcarrier input and output for optimum performance as follows:

Source Impedance	-- $\leq$ 1K
Output Load	-- $\geq$ 50 ohms

d. Ascertain subcarrier input source provides an input signal level within the dynamic input range of the 4180.

e. Select the type of output, linear (L) or shaped (S), at the OUTPUT switch for the particular application.

f. Using an external signal source, apply center frequency and bandedge frequency inputs, alternately, and adjust the BAL and BEV controls for the desired output voltages. For a normal setup, the output voltage for a center frequency input should be set at 0-volt using the BAL control. Output voltage for a bandedge frequency input may be adjusted to any value up to 2 volts peak-to-peak with the BEV control (with an open circuit at the output). Maximum voltage adjustable for an output termination of 50 ohms is 1 volt peak-to-peak. When it is desired that the output voltage be offset, the BAL control is used to set the offset voltage for a center frequency input. The BAL control provides an offset adjustment of up to ±0. 5 volt with a 50-ohm load.



PIN	FUNCTION
1	INPUT, TSC
2	TSC RETURN
3	
4	
5	OUTPUT RETURN
6	OUTPUT, DATA
7	AC NEUTRAL
8	AC PHASE
9	
10	
11	
12	
13	
14	INPUT, SUBCARRIER
15	INPUT RETURN
16	CHASSIS GROUND

Figure 3-1. EMR 4180 External Electrical Connections

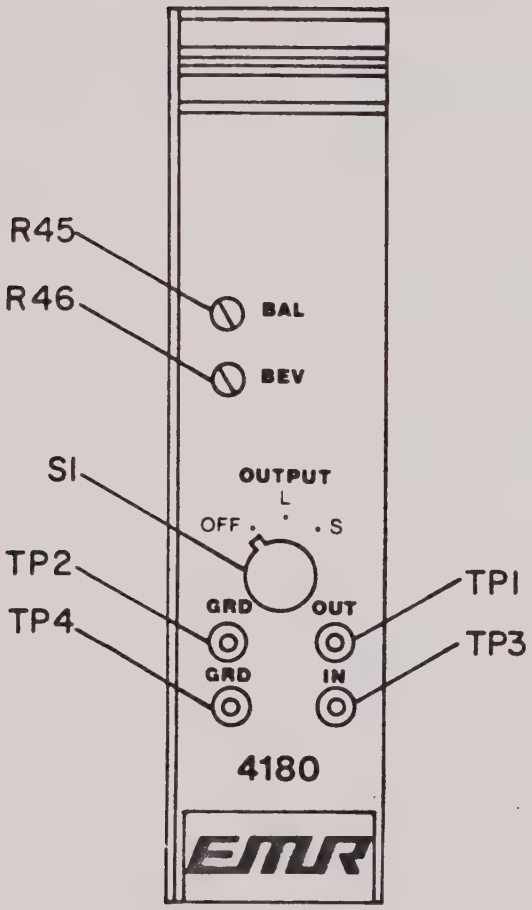


Figure 3-2. EMR 4180 Operating Components

Table 3-1. Function of Controls and Monitor Jacks, 4180 High-Frequency Discriminator

DESIG.	NAME	FUNCTION
R45	BAL potentiometer	Adjusts the data output to zero volt with a subcarrier channel center frequency input.
R46	BEV potentiometer	Adjusts the maximum voltage excursions for full channel deviation at the linear output.
S1	OUTPUT switch	Three position switch serves as an OFF/ON switch and OUTPUT select switch. The "L" position selects linear output, and the "S" position selects shaped output.
TP1	OUT test jack	Discriminator data output signal. This is same output as selected by front panel OUTPUT switch.
TP2 and TP4	GRD test jacks	Ground.
TP3	IN test jack	Subcarrier signal level at the output of the discriminator input filter.

SECTION 4

THEORY OF OPERATION

4.1 GENERAL

This section contains a detailed description of the 4180 circuits. The circuit descriptions are based on the detailed block diagram, Figure 4-1, with reference to waveform diagrams, Figures 5-1 and 5-2, and to schematic diagrams in Section 5. For an overall description of the 4180 circuits, refer to Section 1, paragraph 1.2.

4.2 BANDPASS INPUT FILTER (BPIF)

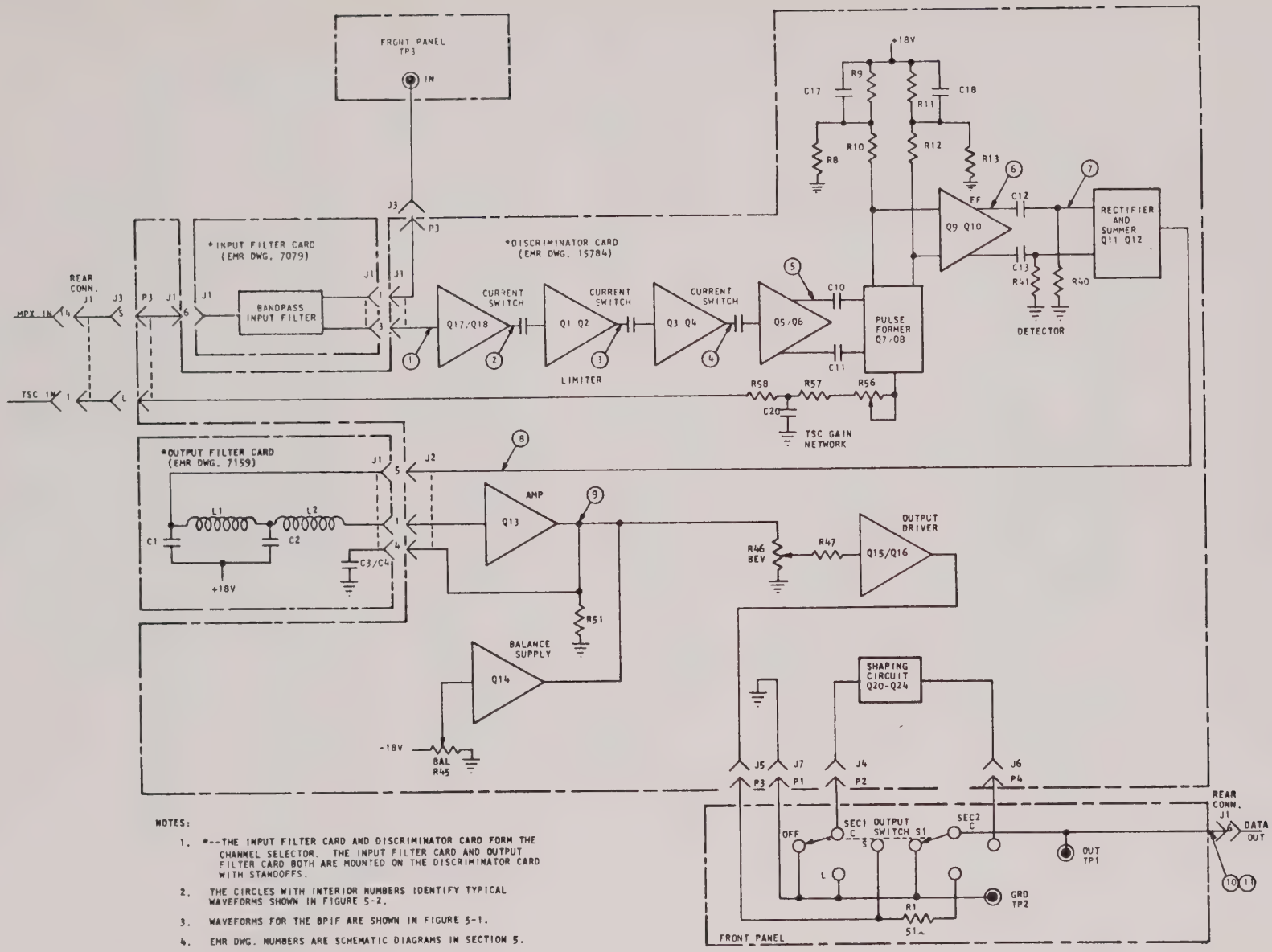
The BPIF is a series tuned filter which is designed to extract only the frequencies contained in a subcarrier channel. All other frequencies in the multiplex (MPX) input are attenuated. This circuit is either a four-pole pair bandpass filter or a two-pole pair bandpass filter, depending on the deviation parameter in the unit. A four-pole pair configuration is used in units with deviations of 30% or less. The two-pole pair configuration is used in units with deviations above 30%. The filter consists of passive filter components which form the filter poles and active isolation stages between the filter poles. Components of the BPIF are located on the input filter card which is mounted on the discriminator card. The combination of these cards form the channel selector. Typical waveforms for the BPIF are shown in Figure 5-1.

4.3 LIMITER CIRCUIT

The limiter circuit operates from the subcarrier signal output of the BPIF to provide two squarewave outputs representative of the subcarrier signal input. Included in the limiter circuit are three current switching stages and a phase splitting stage. Components of this circuit are located on the discriminator card which is a portion of the channel selector.

Each of the current switching stages contain a transistor-pair which are operated as a non-saturating comparator. The current in each stage is switched from one transistor to the other by the subcarrier signal input. Gain in each stage is sufficient such that the third stage output is a squarewave representative of the subcarrier signal input. Zero crossings of the squarewave output correspond to the zero crossings of the subcarrier input. Typical waveforms of the limiter circuit are shown in Figure 5-2.

The phase-splitting stage Q5/Q6 is also a transistor pair stage similar to the current switching stages. This stage is also current operated and is triggered



NOTES:

1. *--THE INPUT FILTER CARD AND DISCRIMINATOR CARD FORM THE CHANNEL SELECTOR. THE INPUT FILTER CARD AND OUTPUT FILTER CARD BOTH ARE MOUNTED ON THE DISCRIMINATOR CARD WITH STANDOFFS.
2. THE CIRCLES WITH INTERIOR NUMBERS IDENTIFY TYPICAL WAVEFORMS SHOWN IN FIGURE 5-2.
3. WAVEFORMS FOR THE BPIF ARE SHOWN IN FIGURE 5-1.
4. EMR DWG. NUMBERS ARE SCHEMATIC DIAGRAMS IN SECTION 5.
5. DWG. CONTROL NO. 4180-002.

Figure 4-1. EMR 4180 Detailed Block Diagram

by the third current switching stage output. The outputs from this stage are squarewave signals 180° out-of-phase. The output of one side is shown in Figure 5-2.

4.4 DETECTOR CIRCUIT

The detector is essentially an energy detecting circuit which generates a serial pulse stream from subcarrier rate inputs and determines the average amount of energy in the pulse stream. Inputs to the detector are two squarewave subcarrier rate signals, 180° out-of-phase, derived from the limiter circuit. Included in the detector are two independent pulse forming networks and a rectifier/summer stage. Typical waveforms of the detector circuit are shown in Figure 5-2.

Each of the pulse forming networks operate from a squarewave input to construct a current pulse whose recovery time and shape are set by discrete timing components. The repetition rate of the current pulse is equal to the zero-crossing rate of the subcarrier signal input. The pulse time period set by the timing components is a standard determined by the subcarrier channel on which the discriminator is to operate.

When the subcarrier input is operating at center frequency, the current pulse stream generated contains a certain energy level. Increases or decreases in subcarrier frequency change the rate at which the current pulses are generated. This results in an increase or decrease of energy level in the pulse stream. The change of energy level in the pulse stream is the modulation component.

The actual pulse forming in each network is accomplished by the multiple resistor/capacitor combination shown in Figure 4-1. Each network is triggered by an edge of the squarewave input. The voltage across resistors R40 or R41 is a complex waveform designed for minimum recovery time and for maximum energy. The time required for the capacitor charging action is the time period standard for the selected channel.

The two current pulse inputs to the rectifier circuit are rectified and summed to produce unipolar current pulses of constant energy at each zero crossing. The average value of this energy is obtained in the lowpass output filter which attenuates the subcarrier frequency component, but passes modulation frequency component up to the cutoff frequency of the filter.

An additional input to the detector circuit is the TSC signal from the TSC gain network. This network is factory adjusted to provide sufficient signal level to compensate for any erroneous modulation in the subcarrier channel incurred due to tape recording or playback of the FM multiplex.

4.5 OUTPUT FILTER

The output filter is a lowpass circuit designed to attenuate the subcarrier frequency at the detector output and supply an output voltage representative of the modulation component in the subcarrier channel. Included in the output filter are passive filter components located on the output filter card, and an amplifier stage on the discriminator card. Typical waveforms for the output filter are shown in Figure 5-2.

The output filter is effectively a five-pole network which consists of a four-pole passive filter on the output filter card and a single pole filter consisting of amplifier Q3 and resistor R51 on the discriminator card and capacitor C3/C4 on the output filter card. The data cutoff frequency and response characteristics are built-in features of each output filter card. Two output filter characteristics are available, constant delay and constant amplitude.

4.6 OUTPUT CIRCUITS

The output circuits consist of an output driver, Q15/Q16, a balance supply, Q14/R45, and a shaping circuit, Q20-Q24/R45. These circuits operate to provide either a linear data signal output or a shaped output, depending on the type of data contained in the incoming subcarrier channel.

The balance supply, in conjunction with BAL potentiometer R45, adjusts the data output signal from the lowpass output filter to an effective zero-volt when the incoming subcarrier is at center frequency. This output is then coupled through output driver, Q15/Q16, to the front panel OUTPUT select switch. If the data in the subcarrier channel is an analog function, the OUTPUT switch should be positioned to linear (L) which routes the data signal directly to the data output. If, however, the data in the subcarrier channel is pulse-type data, the OUTPUT switch may be positioned to shaped (S) and the data signal is applied to a shaping circuit.

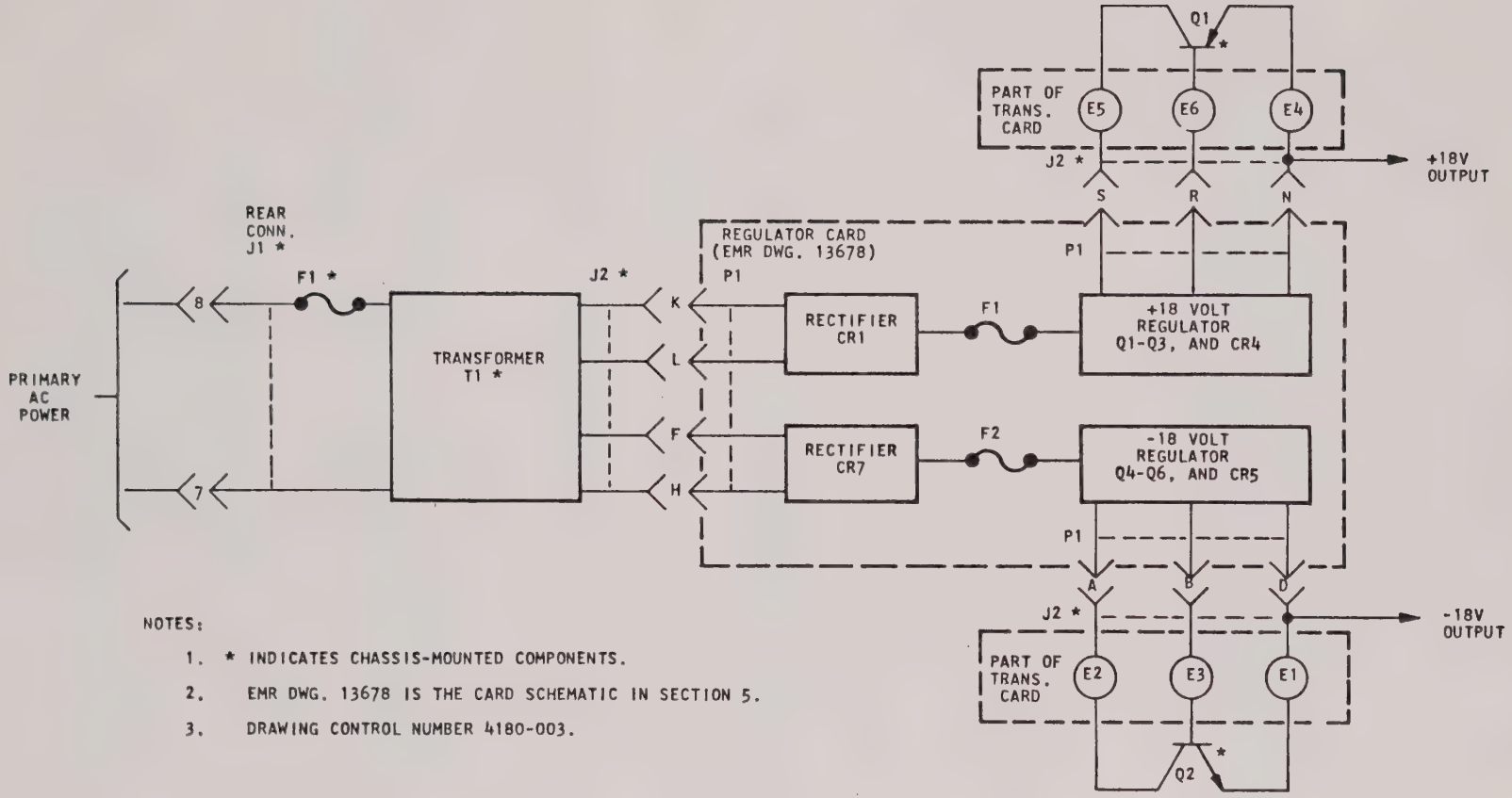
The shaping circuit produces data pulses with rise and fall times of less than 100 nanoseconds. This circuit is a differential current switching network which provides a 5-volt peak-to-peak squarewave output at the data frequency of the subcarrier channel. Subcarrier channel deviations of ±10% of full-bandwidth or greater are required to switch the input comparator stage (Q20 and Q21). Outputs from this stage trigger current operated transistor switch (Q22 and Q23) which operates in conjunction with transistor Q24 to provide the square-wave output. For the negative excursions, Q22 is the current source; and, for the positive excursions, Q24 is the current sink. Typical waveforms for this circuit are shown in Figure 5-1.

The output of the shaping circuit is routed back through the shaped (S) position of the OUTPUT switch to the data output. A third position (OFF) at the OUTPUT switch opens the data output lines and supplies a ground potential at the data output. This ground level potential is derived from a ground connection on the discriminator card.

4.7 POWER SUPPLY AND REGULATOR CIRCUITS

The power supply and regulator circuits operate from a primary AC power input to generate all DC voltage for operation of the 4180. A detailed block diagram of these circuits is shown in Figure 4-2.

Included in these circuits are a step-down transformer, two diode rectifiers, and two regulator circuits. The regulators are conventional series regulators which generate +18 and -18 volts. Regulation is accomplished by comparing a sample of the output potential with a voltage reference established by a zener diode. Any voltage change is amplified by a differential amplifier and supplied to the series regulator transistor. Protection from the AC power input and internal overload is provided by a rear panel fuse, F1, and regulator card fuses, F1 and F2.



NOTES:

1. * INDICATES CHASSIS-MOUNTED COMPONENTS.
2. EMR DWG. 13678 IS THE CARD SCHEMATIC IN SECTION 5.
3. DRAWING CONTROL NUMBER 4180-003.

Figure 4-2. Power Supply and Regulator Block Diagram

SECTION 5

MAINTENANCE

5.1 GENERAL

This section contains information to aid in maintaining the EMR 4180. The maintenance information includes a Maintenance Guide (paragraph 5. 2), Adjustment Information (paragraph 5. 3), and Drawings (paragraph 5. 4). Prior to attempting any maintenance of the 4180, the operator should be thoroughly familiar with the operating procedures and theory of operation as contained in Sections 3 and 4 of this manual.

5.2 MAINTENANCE GUIDE

In the event an abnormal condition is detected in the 4180 operation, the following general method of isolating and repairing the trouble is recommended.

a. Perform an inspection (paragraph 5. 2. 1).

b. Perform troubleshooting procedures (paragraph 5. 2. 2).

c. When defective component is located, refer to Section 6, Parts List, for replacement component information.

d. Recheck affected circuit to ascertain that the malfunction is repaired.

e. Refer to adjustment information (paragraph 5. 3) before attempting any readjustment.

5. 2. 1 Inspection

The 4180 should be subjected to a regular inspection program similar to that recommended for other types of electronic equipment. The inspection program should be performed periodically as a means of preventive maintenance; or, if a malfunction occurs, to aid in isolating the trouble. The inspection should include the following:

a. Remove the side cover and inspect front and rear panel components for signs of damage.

b. Inspect wiring for loose or broken connections.

c. Inspect printed-circuit cards and card connectors for mechanical damage or component discoloration.

5.2.2 Troubleshooting Guide

An electrical malfunction in the 4180 will normally be located on one of the printed-circuit cards. This paragraph contains a step-by-step procedure for checking card operation and isolating a malfunction. In performing this procedure, the following test equipment is required:

a. Test Oscillator -- Tektronix 191 or equivalent.

b. DC Voltmeter -- Fluke 825A or equivalent.

c. Oscilloscope -- Tektronix 545A or equivalent.

Perform the checkout procedure as follows:

a. Check the power supply and regulator as follows:

1. Using the DC voltmeter, check the regulator card terminals for the proper DC voltage outputs.

J2-N -- +18 volts ±0.05 volt
J2-D -- -18 volts ±0.05 volt

2. If the voltages are within tolerance, refer to step (b) of this procedure. If not, refer to the regulator card schematic diagram (EMR Drawing 13678) and to the power supply/regulator transistor voltages (Table 5-1), and troubleshoot the power supply/regulator. Observe instructions in the notes in Table 5-1 when taking voltage measurements.

b. Check the input filter card as follows:

1. Using the external test oscillator, apply a subcarrier input at rear connector J1-14 of 100 millivolts peak-to-peak at center frequency of the unit.

2. Using the oscilloscope and input filter schematic diagram (EMR Drawing 7079), observe the input filter waveforms as shown in Figure 5-1. If a defective stage is located, refer to the transistor voltages in Table 5-2 and troubleshoot the defective stage. Observe instructions in the notes in Table 5-2 when taking voltage measurements.

Table 5-1. EMR 4180 Power Supply/Regulator Transistor Voltages

TRANSISTOR	EMITTER	BASE	COLLECTOR
Q1	+24 to +33	+23.4 to +32.4	+18.6
Q2	+8.4	+9.0	+23.4 to +32.4
Q3	+8.4	+9.0	+18.0
Q4	-8.4	-9.0	-23.4 to -32.4
Q5	-8.4	-9.0	-18.0
Q6	-24 to -33	-23.4 to -32.4	-18.6
CHASSIS MOUNTED REGULATOR COMPONENTS			
Q1	-18	-18.6	-24 to -33
Q2	+18	+18.6	+24 to +33

NOTES:

1. Voltages taken during normal operation.
2. Use DC voltmeter referenced to ground for measurements.

Table 5-2. Input Filter Card Transistor Voltages

COMPONENT	EMITTER	BASE	COLLECTOR
Q1	-.74	0	+18.0
Q2	-.68	0	+18.0
Q3	-.86	0	+18.0
Q4	-.68	0	+18.0
Q5	-.70	0	+18.0
Q6	-.66	0	+18.0
Q7	-.72	0	+18.0
Q8	-.67	0	+18.0
Q9	-.78	0	+17.4
Q10	-.68	0	+12.5

NOTES:

1. Use DC voltmeter referenced to ground for measurements.

2. Subcarrier input at ground level.

NOTE

Two configurations of the input filter card exist. For units with deviations of 30% or less, the card circuitry is as shown in EMR Drawing 7079. However, for units with deviations above 30%, certain components are not included. For these units, a jumper is installed between resistor R16 and the base element of transistor Q9. Components between are excluded from the card and, therefore, certain waveforms in Figure 5-1 and transistor voltages in Table 5-2 are not applicable.

3. Repairs on this card are limited to transistor, capacitor, and resistor replacement. If an inductor is found to be defective, return the unit to EMR for repair and readjustment.

c. Check the discriminator card and output filter card as follows:

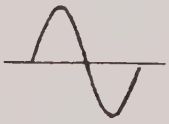
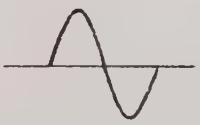
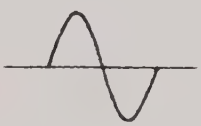
1. The initial setup is the same as step (b. 1) except decrease subcarrier input to 20 Mv peak-to-peak.

2. Refer to the detailed block diagram, Figure 4-1; discriminator card schematic diagram, EMR Drawing 15784; and using the oscilloscope observe the waveforms shown in Figure 5-2. The waveform numbers of Figure 5-2 correspond to the numbers in the reference balloons in Figure 4-1.

NOTE

When observing the waveforms on this card, ascertain that the instructions in the INSTRUCTION column of Figure 5-2 are closely followed.

3. When a defective stage is located, refer to the discriminator card transistor voltages in Table 5-3 and troubleshoot the defective stage. Observe the notes in Table 5-3 when taking voltage measurements.

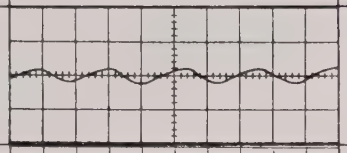
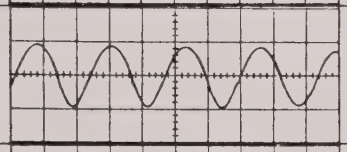
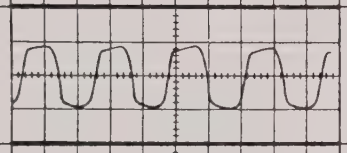
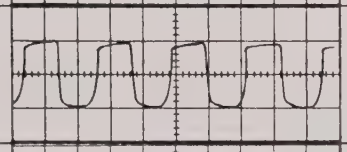
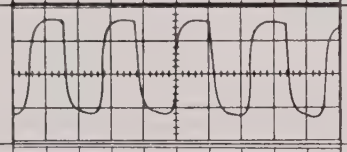
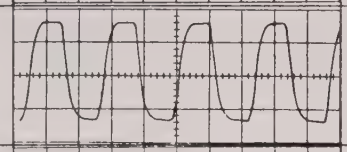
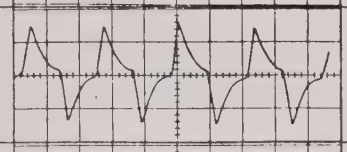
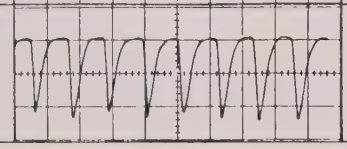
CIRCUIT LOCATION	WAVEFORM	AMPLITUDE
CARD INPUT TERMINAL J1-6		100 Mv P/P
EMITTER OF Q1		100 Mv P/P
EMITTER OF Q3		80 Mv P/P
EMITTER OF Q5		100 Mv P/P
EMITTER OF Q7		90 Mv P/P
EMITTER OF Q9		160 Mv P/P
CARD OUTPUT TERMINAL J1-1		90 Mv P/P

NOTES:

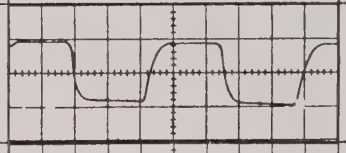
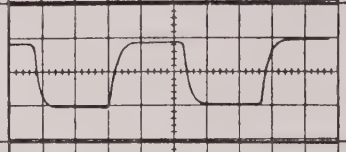
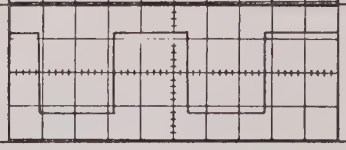
1. All waveform measurements are referenced to ground. Scope is AC coupled.

Figure 5-1. Input Filter Card Waveforms

DISCRIMINATOR INPUT -- Center frequency at 20 millivolts P-P.

WAVEFORM NUMBER	CIRCUIT LOCATION	INSTRUCTION	WAVEFORM	AMPLITUDE
1	Base of Q17.	Referenced to ground.		100 Mv/Cm
2	Across R28.	Referenced to +18V.		100 Mv/Cm
3	Across R2.	Referenced to +18V.		500 Mv/Cm
4	Across R4.	Referenced to +18V.		500 Mv/Cm
5	Across R6.	Referenced to +18V.		500 Mv/Cm
6	Emitter of Q9.	Referenced to ground.		2V/Cm
7	Base of Q11.	Referenced to ground.		1V/Cm
8	J2 Pin 5.	Remove output filter card and install a 51-ohm resistor from J2 pin 5 to the +18-volt supply. Referenced to +18V.		20v Mv/Cm

DISCRIMINATOR INPUT -- Center frequency at 20 millivolts P-P. Modulate subcarrier to bandedges with a squarewave of 1/10 the output filter cutoff frequency.

WAVEFORM NUMBER	CIRCUIT LOCATION	INSTRUCTION	WAVEFORM	AMPLITUDE
9	J2 pin 4.	Referenced to ground.		1V/Cm
10	Front panel OUT test jack.	Install a 50-ohm load to ground at output. Select L (linear) at OUTPUT switch. Referenced to ground.		0.5V/Cm
11	Front panel OUT test jack.	Install a 50-ohm load to ground at output. Select S (shaped) at OUTPUT switch. Referenced to ground.		2V/Cm

NOTES.

1. In observing the waveforms, do not connect oscilloscope ground to 4180 ground unless instructed in the waveform instructions.
2. Drawing Control Number 4180-004.

Figure 5-2. Discriminator Card Waveforms

Table 5-3. Discriminator Card Transistor Voltages

COMPONENT	EMITTER	BASE	COLLECTOR
Q1	-.60	0	+17.5
Q2	-.60	0	+10.25
Q3	+.45	0	+17.5
Q4	+.45	0	+10.15
Q5	+.53	0	+14.25
Q6	+.53	0	+14.40
Q7	-.10	0	+14.50
Q8	-.10	0	+14.50
Q9	+15.6	+14.50	+18.0
Q10	+15.6	+14.50	+18.0
Q11	+.40	+.30	+15.1
Q12	+.40	+.30	+15.1
Q13	+15.8	+15.1	0
Q14	-7.70	-7.0	0
Q15	-.70	0	+16.0
Q16	+16.7	+16.0	0
Q17	-.73	0	+17.6
Q18	-.73	0	+9.15
HIGH BANDEDGE FREQUENCY			
Q20	+.65	+1.00	-8.20
Q21	+.65	0	-7.10
Q22	-7.70	-8.20	+2.50
Q23	-7.70	-7.10	+6.70
Q24	+7.60	+6.70	+2.50

NOTES:

1. Use DC voltmeter referenced to ground for measurements.

2. Subcarrier input at center frequency, 20 Mv peak-to-peak, except for Q20 through Q24 which are taken with the subcarrier input equal to the HBE frequency.

5.3 ADJUSTMENT INFORMATION

The internal adjustments in the 4180 are extremely critical and require specialized equipments to perform. Therefore, no field adjustments are recommended. If readjustment is necessary, return the unit to EMR.

5.4 DRAWINGS

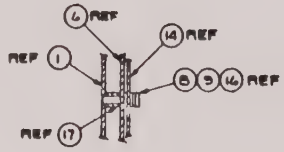
The 4180 drawings are arranged in descending order starting with the top assembly diagram and continuing through all subassembly, schematic, and wiring diagrams. Table 5-4 lists the drawings, the order in which they appear in this manual, and the EMR drawing numbers.

Subassemblies and/or components of the assemblies on the assembly diagrams are identified by reference numbers within the balloons. These numbers correspond to item numbers on the associated parts list in Section 6 of this manual. The assembly drawing and associated parts list are identified by the same number. For example, the subassemblies shown in the top assembly drawing, 15781, are listed by item number on PL-15781 in Section 6. This parts list outlines the subassemblies by name and assembly drawings in which the subassemblies are illustrated. For example, item 2 on drawing 15781 is identified on PL-15781 as the front panel assembly which is illustrated independently on EMR Drawing 16283. The parts on this assembly are listed on PL-16283. Subsequent assembly drawings and parts breakdown is performed in the same manner.

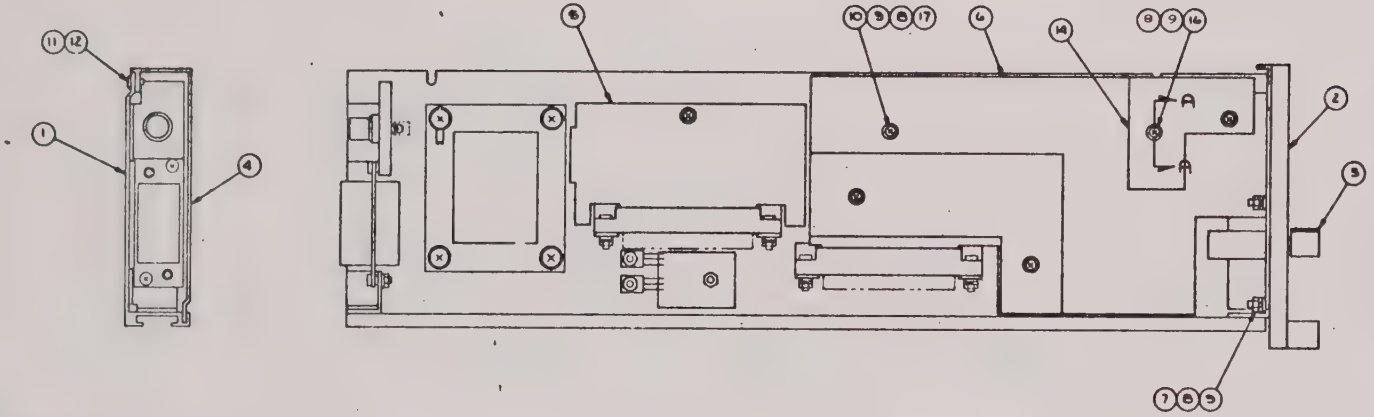
Table 5-4. EMR 4180 Drawings

NAME	NUMBER
EMR 4180 High-Frequency Discriminator Assembly	15781
Chassis Assembly	16274
Transistor Board	15725
Front Panel Assembly	16283
Regulator Card Assembly	13680
Schematic	13678
Channel Selector Assembly	17650
Discriminator Card Assembly	15782
Schematic	15784
Input Filter Card Assembly	7077
Schematic	7079
Channel Selector Assembly	7087
Schematic	7159
Wiring Diagram	16419

REVISIONS				
DTR				
A	ECO # 121	5 8 68		
B	ECO 35453	12-2-68	SEE ECO	
C	ECO 36764	(8 3 69)		
D	[illegible]	11-8-71		



SECTION A-A



NOTES

1. REF: IDENTIFIER EMR DWG. NO. 15719.
2. ITEM 20(R1) TO BE MOUNTED ON S1 PER WIRING DIAGRAM 16419
3. INSTALL CONTACT PINS P1 THRU P4 PER WIRING DIAGRAM 16419
4. APPLY APPLICABLE INFORMATION TO NAMEPLATE PER EMR 13406, CLASS B, TYPE 15.

		083 85000	FOR PARTS LIST SEE P/L 15781			
REQUIRED		PT. NO.	DESCRIPTION	PART CLASS	MFR. CODE	ITEM OR DWG. NO.

LIST OF MATERIALS

UNLESS OTHERWISE SPECIFIED

CLOUSE

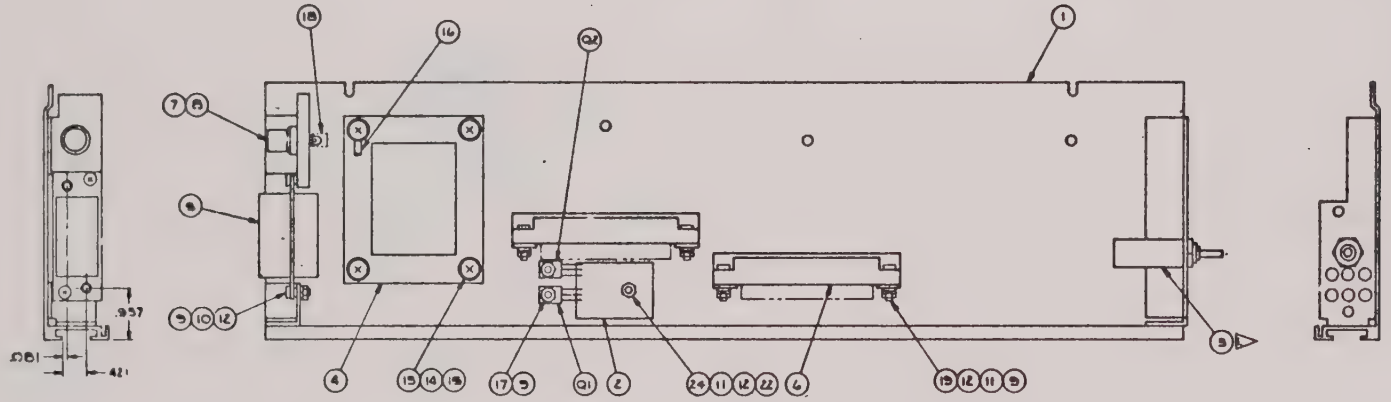
EMR — INC. 1968

DISCR. ASSEMBLY, HIGH FREQ

ASC	FINAL	4150
15406		

86141	D	15781	
1/1		083 85000 383	

REVISIONS				
SYM	DESCRIPTION	SEE ECO	DATE	APPROVED
A	ECO 35457 1/2-12-68	SEE ECO		
B	ECO 40'32 CHG NUT AT ITEM 2	6/28/71	8-19-71	
C	ECO CHNG - B CONFIG ADDED	5/2/75		



NOTES

▷ BSC 4-3 CONFIG 4 POS., -1 CONFIG 3 POS. 4-2 CONFIG 2 POS.

PART NO.	DESCRIPTION
042-89-00214	FOR PARTS LIST SEE P/L 16274-3
042 89 00034	FOR PARTS LIST SEE P/L 16274-2
042 89 00034	FOR PARTS LIST SEE P/L 16274-1
042 89 00034	FOR PARTS LIST SEE P/L 16274

LIST OF MATERIALS

-3	15708-1	4580 01-8
-2	1518A	4880
-1	1518A1	4180
BSC	1518-S	4580

DO NOT SCALE DRAWING

BRANCH BY CLOUSE 1/1/68

CHECKED 7-68

DES. ENGINEER

PROJECT ENGR 7/1/68

MATERIAL

APPROVED

APPROVED

MIL-STD-202 METHOD 215 J3406 CLASS B TYPE 15

TREATMENT OR FINISH

EMR ELECTRO-MECHANICAL RESEARCH, INC. © EMR, INC. 1968

CHASSIS, ASSEMBLY

CODE IDENT NO	SIZE	DWG NO	REV
06141	D	16274	C

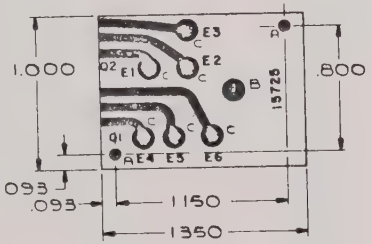
SCALE 1/1 042 89 00034 SHEET 1 OF 1

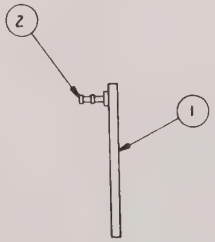
(Revision C)

HOLE CHART		
HOLE		DESCRIPTION
A	2	.062±.002 DIA TOOLING HOLE
B	1	.125 DIA
C	6	.076 DIA FOR ITEM 2

REVISION INDEX						
SHEET NO	1	2				
REVISION						

REVISIONS				
SYM	DESCRIPTION	SERIAL EFFECTIVE	DATE	APPROVED





15725 | 1

NOTES

1. BOARD, LAMINATED, .062 THK FLGF062C2/0BIIB PER MIL-P-13949.

QUANTITY REQUIRED		BASIC	DWG SIZE	PART NO	DESCRIPTION	PART CLASS	MFR CODE	ITEM OR SYMBOL
2	1	X		20459 00182	FOR PARTS LIST SEE P/L 15725			

LIST OF MATERIALS

BSC	16274 2	4880
BSC	16274 1	3180
BSC	16274	1580

UNLESS OTHERWISE SPECIFIED
DO NOT SCALE DRAWING
MATERIAL
1
TREATMENT FINISH NOTES
1. ALL APPLICABLE AS SHOWN

DRAWN BY CLOUSE 6276B
CHECKED
DESIGN ENGINEER
PROJECT ENGINEER 7/1/68
APPROVED

SARASOTA DIVISION EMR, INC. 1968
ELECTRO MECHANICAL RESEARCH, INC. · SARASOTA, FLORIDA

PRINTED WIRING BOARD
TRANSISTOR

IDC

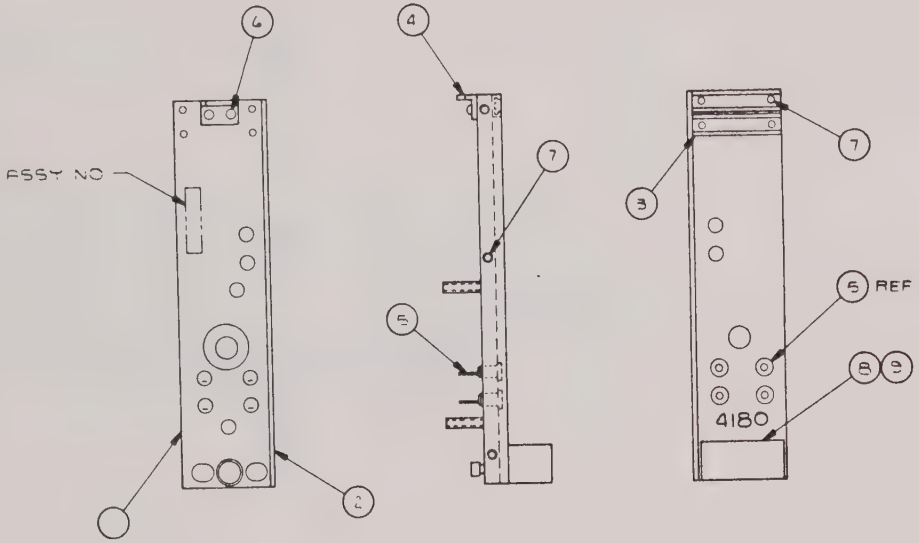
ENGINEERING NO	CODE	SIZE	NO.
06141	C	15725	

SCALE 2/1 | 20459 00182 | SHEET 1 OF 1

EMR 3 2 174 W OZALID

REVISION INDEX						
SHEET NO	1	2				
REVISION						

REVISIONS				
SYM	DESCRIPTION	SERIAL EFFECTIVE	DATE	APPROVED



16283 1

16283

NOTES

1. PAINT & MARKING COLORS PER PCA

-2	-1	DAS C	DWG SIZE	PART NO	DESCRIPTION	PART CLASS	MFG CODE	ITEM OR SYMBOL
		X		19189-00258	FOR PARTS LIST SEE P/L 16283			—

REQUIRED

LIST OF MATERIALS

UNLESS OTHERWISE SPECIFIED
DO NOT SCALE DRAWING

DRAWN BY	DATE
CLOUSE	6/2/65
DESIGNER	
CHECKER	
DESIGN ENGINEER	
PROJECT ENGINEER	
APPROVED	
APPROVED	

EMR TELEMETRY DIVISION & EMR, INC. 1968
ELECTRO-MECHANICAL RESEARCH, INC. • SARASOTA, FLORIDA

PANEL, ASSY. FRONT

EDC

FSC	16781	4180
ASSY NO	PART NO AND DASH NO	USED ON

APPLICATION

NEXT ASSY PART NO PLR
180%
LOCATE APPROX AS SHOWN

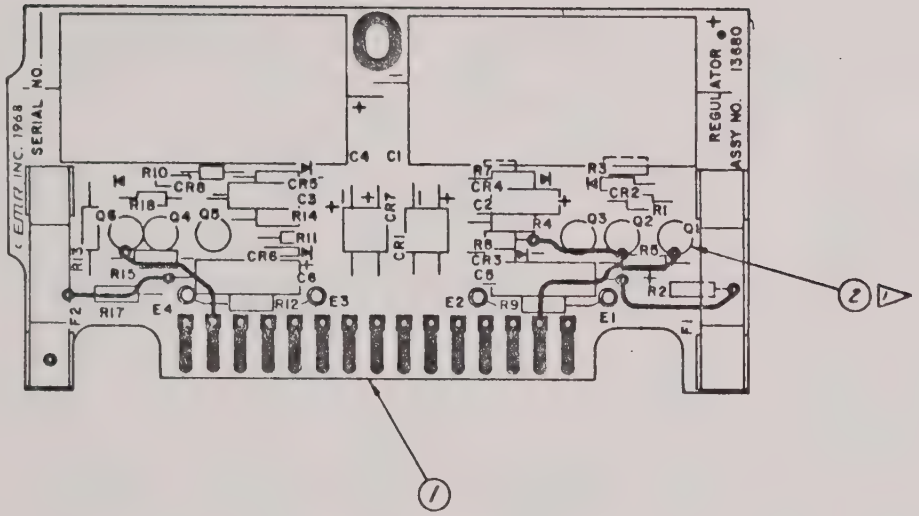
MATERIAL

TREATMENT OR FINISH

CONTRACT NO	SIZE		REV
06141	C	16283	
SCALE 1:1	19189-00255	SHEET 1 OF 1	

EMR 3 2 140 MOZALUD

SYM	DESCRIPTION	SERIAL EFFECTIVE	DATE	APPROVED
A	REC CHG ADDED -1 CONFIG	N/A	4/15/69	DC



13680

NOTES:

1. FOR USE WITH Q1 THRU Q6

	X		A	205-89	FOR PARTS LIST SEE PL 13650-1			
	X		A	205-89-00392	FOR PARTS LIST SEE PL 13680			
-2	1	BASIC	DWG SIZE	PART NO	DESCRIPTION	PART CLASS	MFG CODE	ITEM OR SYMBOL
REQUIRED					LIST OF MATERIALS			

-1	18520	4059
BSC	15788	4880
BSC	15785	4580
BSC	15781	4180
DASH NO	NEXT ASSY NO	USED ON

APPLICATION

DO NOT APPLY PART NO. PLR

LOCATE APPROX AS SHOWN

UNLESS OTHERWISE SPECIFIED
TOLERANCES — SURFACE FINISH
DECIMALS — ANGLES
.XX = ± .01 — ± 1.0° — 125
.XXX = ± .010
ALL DIMENSIONS ARE IN INCHES
THREADS CLASS 3A OR 2B PER MIL S 7742
REMOVE BURRS AND BREAK EDGES .010 MAX
HOLE TOLERANCES PER EMR SPEC. 1378
DIMENSIONS INCLUDE APPLIED FINISH
EMR WORKMANSHIP STANDARDS APPLY

DO NOT SCALE DRAWING

MATERIAL

TREATMENT OR FINISH

		DATE
DRAWN BY	Hunsberger	1-30-68
DESIGNER		2-14-68
CHECKER		6-3-68
DESIGN ENGINEER		6-6-68
PROJECT ENGINEER		
APPROVED		
APPROVED		

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PRINTED WIRING ASSEMBLY "REGULATOR"

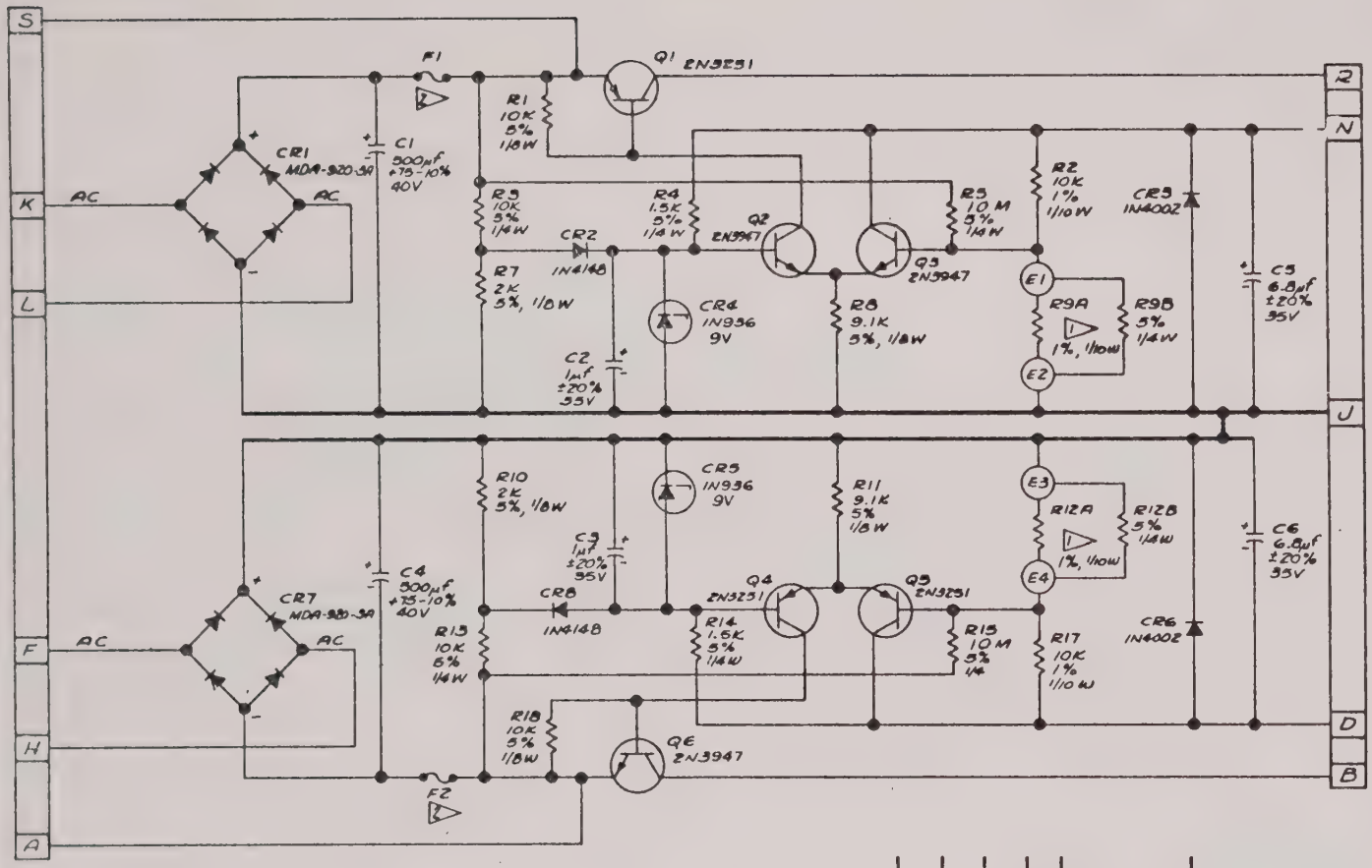
IDC

CODE IDENT NO	SIZE		REV
06141	C	13680	A
SCALE 2:1	205-89-00392	SHEET 1 OF	

5-15

(Revision C)

REVISIONS				
SYM	DESCRIPTION	SERIAL EFFECTIVE	DATE	APPROVED
A	REC CHG CHG'D F1, F2 VALUE	N/A	9/19/69	DC



13678

-2	-1	BASIC	DWG SIZE	PART NO.	DESCRIPTION	PART CLASS	MFG. CODE	ITEM OR SYMBOL
REQUIRED				LIST OF MATERIALS				

NOTES:

▷ TEST VARIABLE

▷ FOR VALUE SEE ASST P/L

R18	R6, R16
Q6	
F2	
E4	
CR8	
C6	
Nº LAST USED	Nº NOT USED

COMPONENT CHART

DASH NO	NEXT ASSY NO	USED ON
-1	13680-1	4059
BSC	13680	4880
BSC	13680	4580
BSC	13680	4180

APPLICATION

DO NOT APPLY PART NO. PER

LOCATE APPROX AS SHOWN

UNLESS OTHERWISE SPECIFIED

TOLERANCES: DECIMALS .XX = ±.01, .XXX = ±.010; ANGLES ± 1/2°; SURFACE FINISH 150 V

ALL DIMENSIONS ARE IN INCHES

THREADS CLASS 3A OR 3B PER MIL-S-7742

REMOVE BURRS AND BREAK EDGES .020 MAX

HOLE TOLERANCES PER EMR SPEC 2378

DIMENSIONS INCLUDE APPLIED FINISH

EDP WORKMANSHIP STANDARDS APPLY

DO NOT SCALE DRAWING

MATERIAL

TREATMENT OR FINISH

		DATE
DRAWN BY	Mueller	2-1-68
DESIGNER	Wm Saltzer	2-14-68
CHECKER	JM	3-1-68
DESIGN ENGINEER		
PROJECT ENGINEER	D. L. Hughes	2-14-68
APPROVED		
APPROVED		

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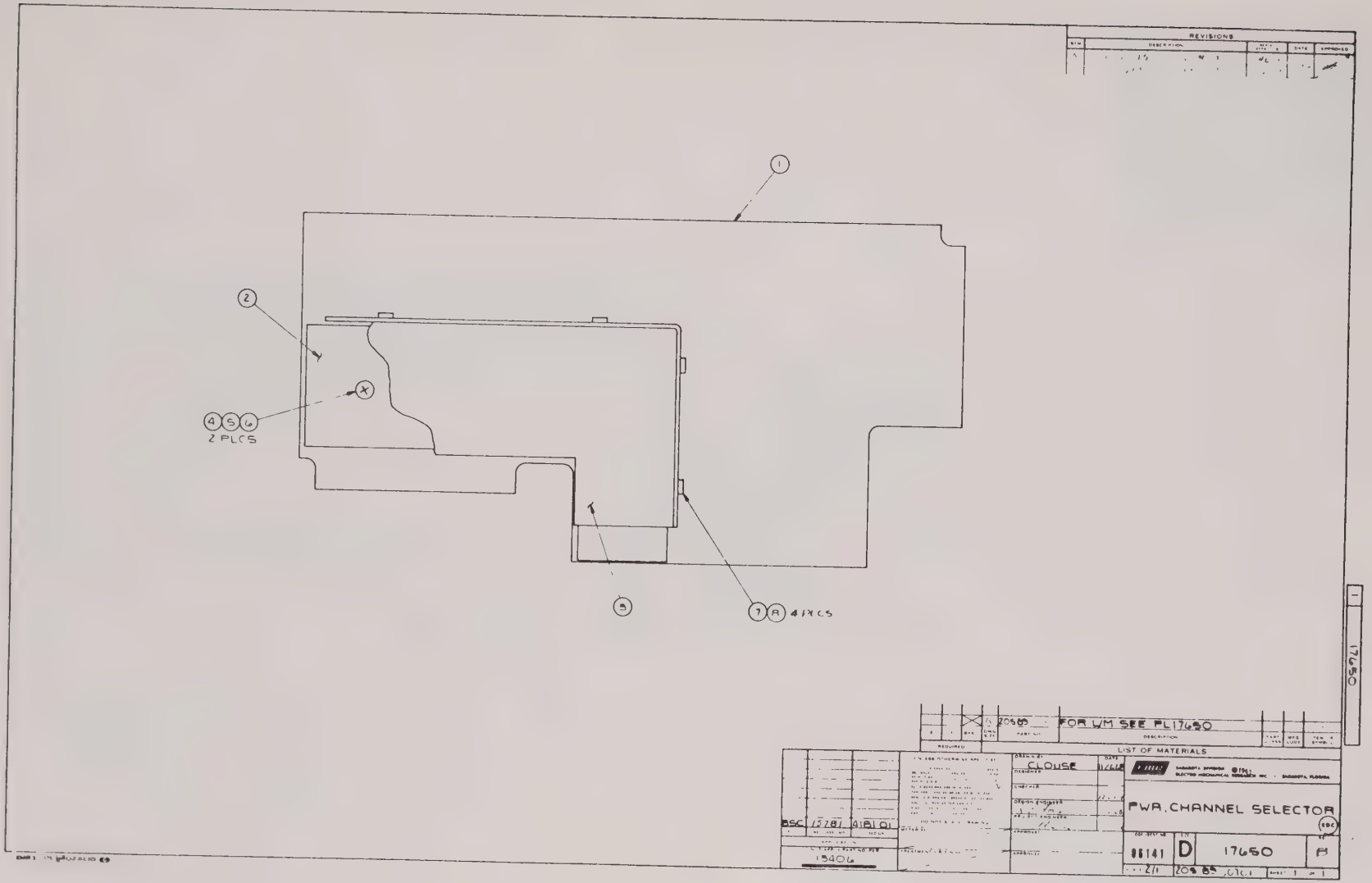
ELECTRO-MECHANICAL RESEARCH, INC. • SARASOTA, FLORIDA

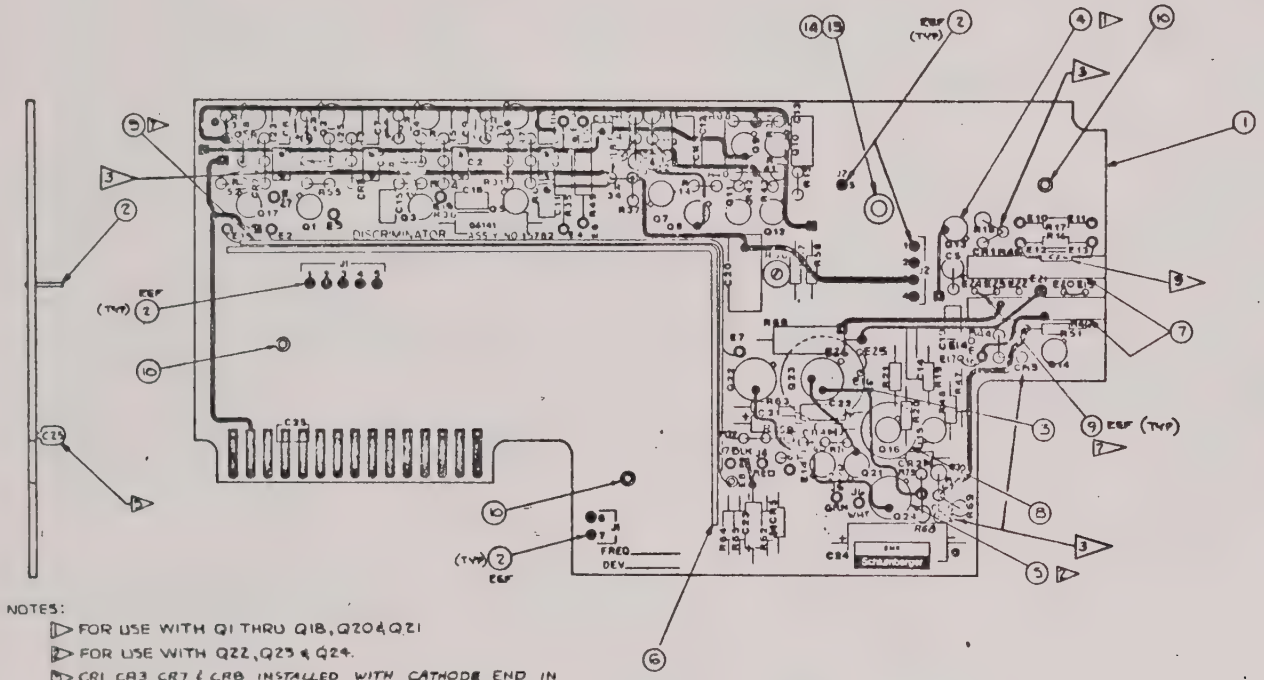
SCHEMATIC POWER SUPPLY REGULATOR

EDC

CODE IDENT NO.	SIZE		REV
06141	C	13678	A
SCALE —	905-01-00325	SHEET 1 OF 1	


REVISIONS
1
2
X
4 5 6
2 PLCS
3
7 A 4 PLCS
17650
FOR WM SEE PL17650
LIST OF MATERIALS
CLOUSE
PWA. CHANNEL SELECTOR
88141
D
17650
B
15406

A	ECO #N 33841 (7-30-68)	1 & UP	11-6-68	DDB
B	ECO #N 34111 (LITTERAL) (8-16-68)	PER ECO NOTE	11-6-68	DDB
C	ECO #N 34259 (8-27-68)	1 & UP	11-6-68	DDB
D	ECO #N 34553 (LITTERAL) (9-13-68)	PER ECO NOTE	11-6-68	DDB
E	ECO #N 34963 (9-17-68)	OPTIONAL	11-6-68	DDB
F	ECO #N 34749 (9-27-68)	1 & UP	11-6-68	DDB
G	ECO #N 35227 (11-22-68)	PER ECO NOTE	11-6-68	DDB
H	ECO #N 35794 (1-7-69)	1 & UP	1-7-69	DDB
J	ECO #N 36063 (1-31-69)	PER ECO NOTE	3-6-69	DDB
K	[illegible]	[illegible]	[illegible]	[illegible]
L	ECO #1148 ADD C66 & NOTE 8	[illegible]	[illegible]	[illegible]
M	ECO 51334 (LITTERAL)	[illegible]	12-5-74	[illegible]
N	ECO 51006 ADD CR7 (CR3 DELETED IN [illegible]	[illegible]	2-5-74	[illegible]
P	ECO 51874 [illegible] WITH CR7 ADDED	[illegible]	[illegible]	[illegible]



15782

NOTES:

1. ▷ FOR USE WITH Q1 THRU Q18, Q20 & Q21
2. ▷ FOR USE WITH Q22, Q23 & Q24.
3. ▷ CR1, CR3, CR7 & CR8 INSTALLED WITH CATHODE END IN SOLDER POT. CR6 INSTALLED WITH ANODE IN SOLDER POT.
4. THE SYMBOLS "—|+" DENOTES END OF COMPONENT THAT MOUNTS ON THE BOARD.
5. ▷ C23 TO BE MOUNTED BETWEEN CONNECTOR FINGERS 4 & 5 AS SHOWN. SPACING TO BE NON-STANDARD.
6. ITEM 12 IDENTIFIES IS TO BE SUPPLIED WITH ASSEMBLY BUT NOT ATTACHED TO IT.
7. ▷ JUMPER E1 TO E8, E2 TO E7, E16 TO E25, E17 TO E18, E19 TO E20 & E23 TO E24.
8. NOMINAL VALUE FOR R16 IS INSTALLED AS CALLED FOR ON VARIABLE CHART BUT MAY BE CHANGED BY TEST.
9. ▷ TEST VARIABLE, OPTIONAL.

—	X	A	705-89-00688	FOR LIST OF MATERIALS, SEE PL-15782	

LIST OF MATERIALS

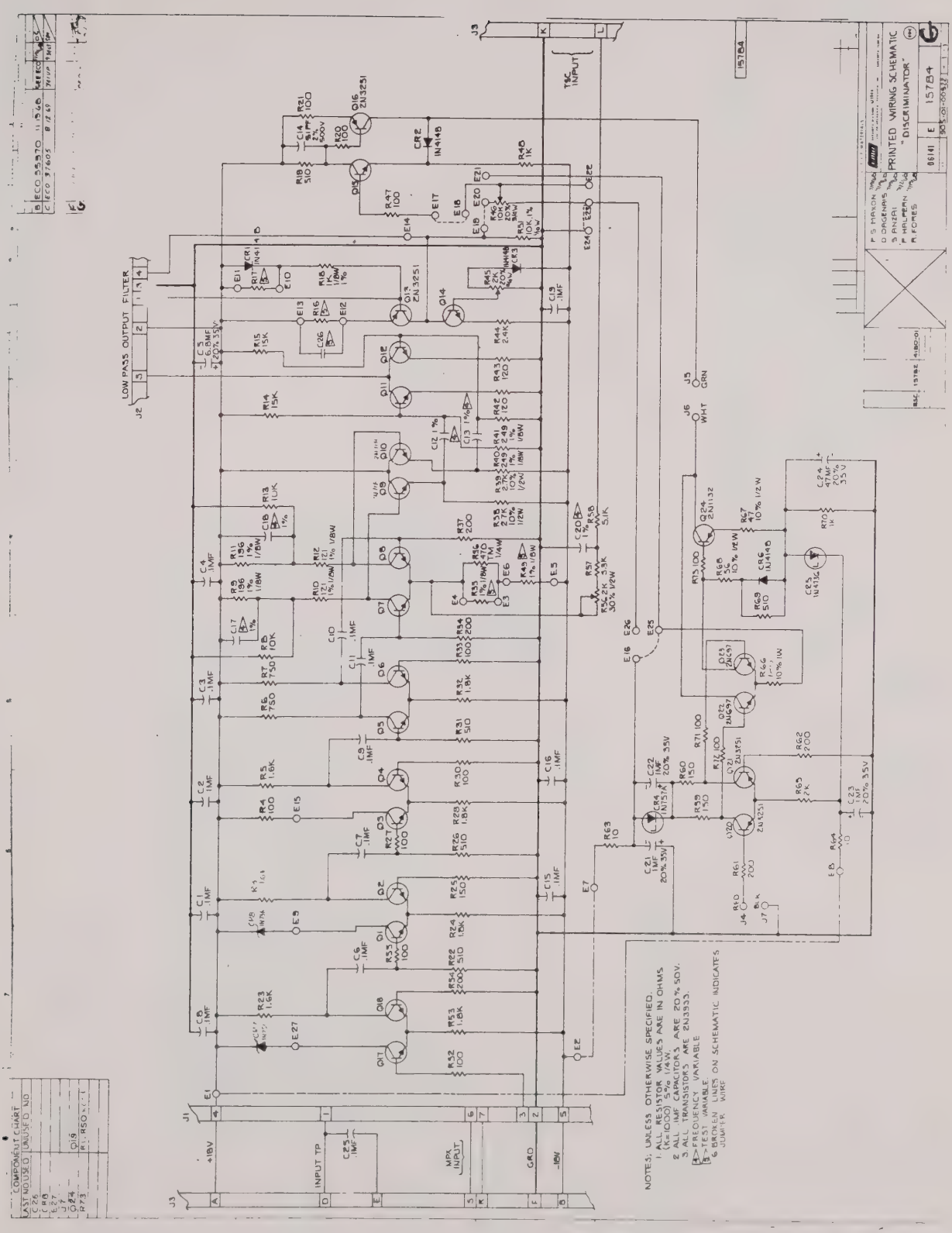
BSC	17450	4180-01	

PRINTED WIRING ASSEMBLY
"DISCRIMINATOR"

06141	D	15782	P
2/1		705-89-00688	

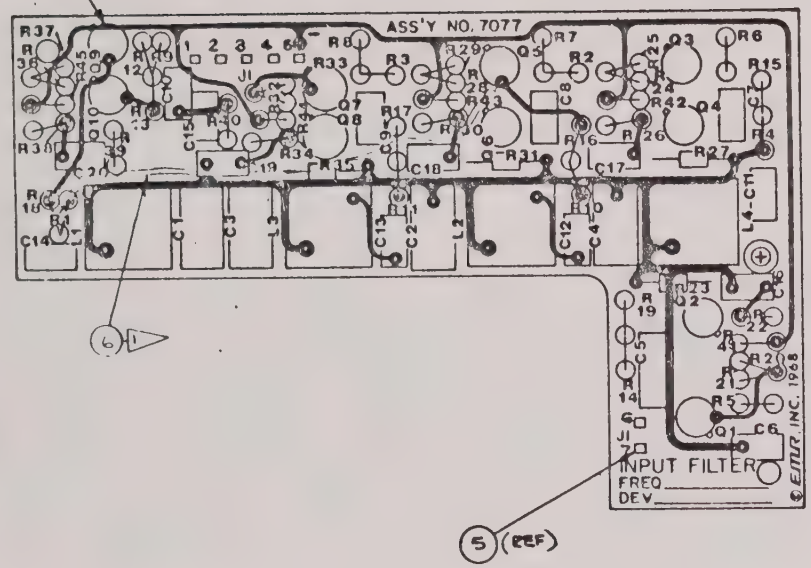
E_18

/Drawings/


PRINTED WIRING SCHEMATIC
"DISCRIMINATOR"
15784
LOW PASS OUTPUT FILTER
TSC INPUT
+18V
-18V
GND
INPUT TP
MPX INPUT
NOTES: UNLESS OTHERWISE SPECIFIED.
1 ALL RESISTOR VALUES ARE IN OHMS
2 ALL IMF CAPACITORS ARE 20% 50V.
3 ALL TRANSISTORS ARE 2N3932.
4 FREQUENCY VARIABLE
5 TEST VARIABLE.
6 BROKEN LINES ON SCHEMATIC INDICATES JUMPER WIRE

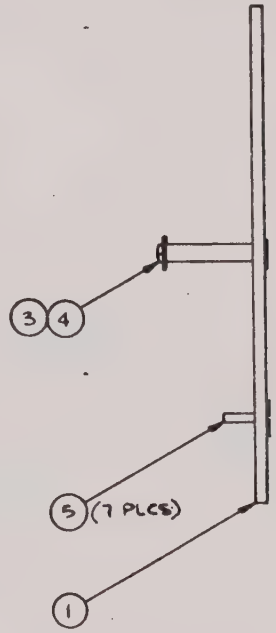
SYM	DESCRIPTION	EFFECTIVE	DATE	APPROVED
A	REL. ADDED -1 CONFIG 2269	N/A	2-24-69	
B	ECO 36720 (5-9-69)	SEE ECO	5-19-69	
C	ECO 37621 (9-12-69)	1 & UP		
D	ECO 40002 NOTE ▷ WAS WIRE - - - -1 CONFIG.	S/N 11 & UP	11-6-70	

(2) (Q1 THRU Q10)



(6) (1)

(5) (REF)



(3) (4)

(5) (7 PLCS)

(1)

7077

NOTES:

▷ WIRE TO BE ROUTED APPROX. AS SHOWN FOR UNITS ABOVE ± 30% DEVIATION.

(2) ▷ -1 CONFIG IS NOT TO BE USED FOR NEW DESIGN, SUPERSEDED BY BASIC CONFIG.

		—	A	205-89-(2) ▷	FOR LIST OF MATERIALS SEE PL-7077-1			—
		X	A	205-89-00468	FOR LIST OF MATERIALS, SEE PL-7077			—
.2	.1	MASH	DWG SIZE	PART NO	DESCRIPTION	PART CLASS	MFG CODE	ITEM OR SYMBOL
REQUIRED					LIST OF MATERIALS			

-1 (1)	7027	4181-02
BSC	15782	4181-M1
BSC	7027	4180-01
DASH NO	NEXT ASSY NO	USED ON

APPLICATION

DO NOT APPLY PART NO. PER

LOCATE APPROX AS SHOWN

UNLESS OTHERWISE SPECIFIED

DO NOT SCALE DRAWING

MATERIAL

TREATMENT OR FINISH

		DATE
DRAWN	Phyllis Dynes	7-13-68
ENGINEER	Phyllis Dynes	7-13-68
CHECKED	J. Falc	7-18-68
DESIGN ENGINEER		
PROJECT ENGINEER	Peter Hofer	7-18-68
APPROVED		
APPROVED		

EMR INC. 1968

SARASOTA DIVISION
ELECTRO-MECHANICAL RESEARCH, INC. • SARASOTA, FLORIDA

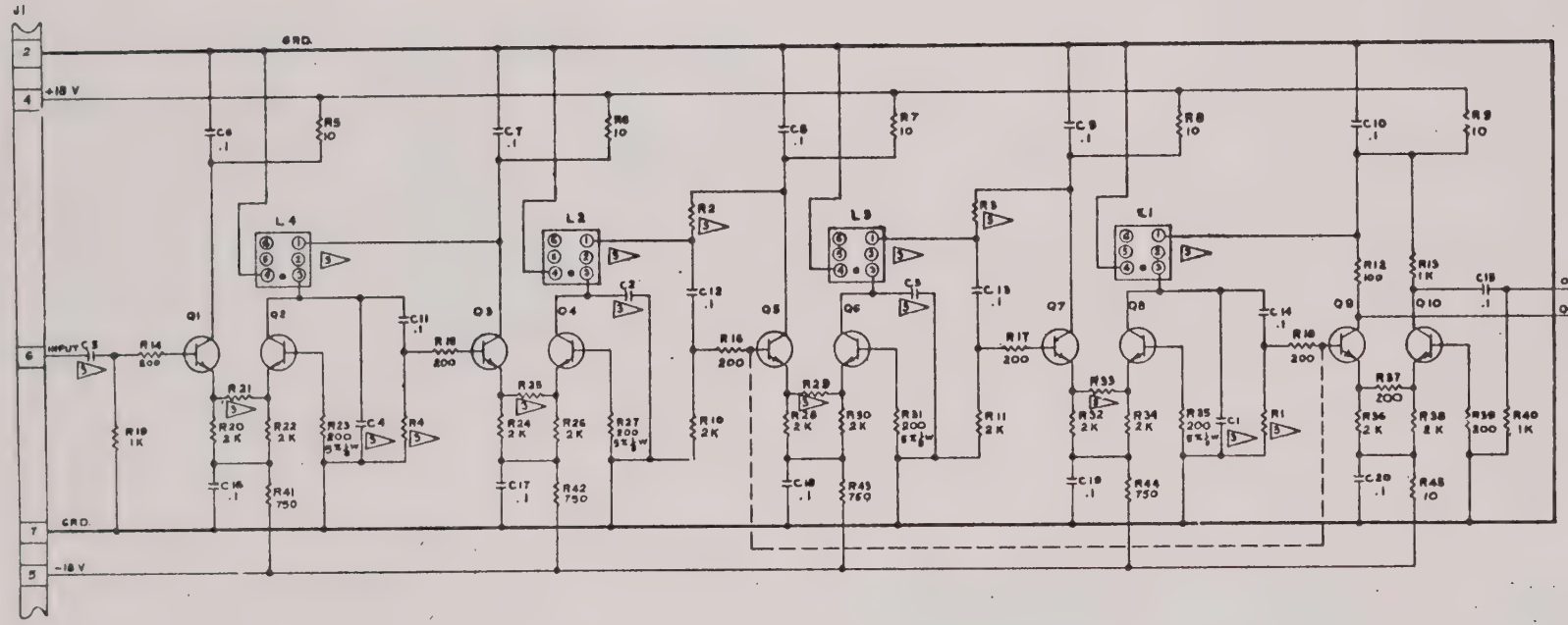
PRINTED-WIRING ASSEMBLY "INPUT FILTER"

SEC

CODE IDENT NO	SIZE		REV
06141	C	7077	D
SCALE: 2/1	205-89-00468	SHEET 1 OF 1	

5-20

(Revision C)



NOTES:

UNLESS OTHERWISE SPECIFIED

1. ALL RESISTOR VALUES ARE IN OHMS (K=1000) 5 % 1/4 W.
2. ALL TRANSISTORS ARE TYPE 2N3933
3. ▷ FREQ. VARIABLE
4. ALL .1 MF CAPACITORS ARE ± 20% 50 V
5. DASHED LINE DENOTES JUMPER USED ABOVE ± 30% DEVIATION
6. NOT USED ABOVE ±30% DEVIATION: C1,C3,C9,C13,C14,C18,C19 L1,L3,Q5,Q6,Q7,Q8,R1,R5,R11,R17,R18,R19,R20,R28, R29,R30,R31,R32,R33,R34,R35,R43,R44

COMPONENT CHART	
LAST NO. USED	UNUSED NO.
C 20	
Q 10	
R 43	
L 4	

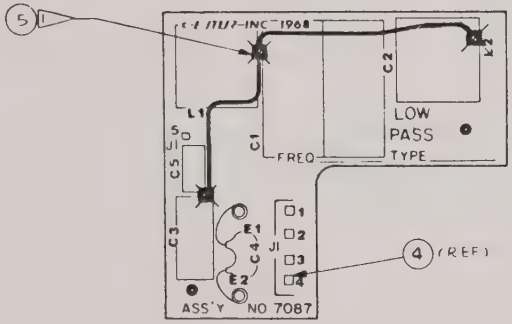
REVISIONS				
	DESCRIPTION			DATE
A	ECO 35374	11-25-69	SEE ECO	
B	ECO 3-79	5 8 63	SEE ECO	
C	ECO 4 3179 AT R37 ▷ WAS 470			
D	ECO 50495 R44 WAS 750Ω			

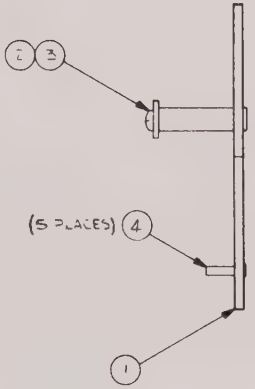
LIST OF MATERIALS

PRINTED-WIRING SCHEMATIC 'INPUT FILTER'

BSC	7077	4180-01	
86141	D	7079	

REVISIONS				
SYM	DESCRIPTION	MFG. EFFECTIVE	DATE	APPROVED
A	REC CHG, ADDED -1 CONFIG	N/A	12-9-68	DE
B	ECO 36714		4-29-69	EWP





7087 | 1

NOTES.

▷ 'X' DENOTES LOCATION OF ITEM NO 5 ('Z' WIRE).

		A	209-E-00687	FOR LIST OF MATERIALS SEE PL 7087-1				
2	1	BASIC	DWG SIZE	PART NO	DESCRIPTION	PART CLASS	MFG CODE	ITEM OR DWG NO
REQUIRED				LIST OF MATERIALS				

UNLESS OTHERWISE SPECIFIED

DRAWN BY — DATE 7-16-68
CHECKED — 7-18
DESIGN ENGINEER — 7-4
PROJECT ENGINEER — 7-4
MATERIAL — APPROVED
DO NOT SCALE DRAWING
THIRD ANGLE PROJECTION — APPROVED

BSC 15781 4180-01

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[illegible] WIRE ASSEMBLY
LOW PASS

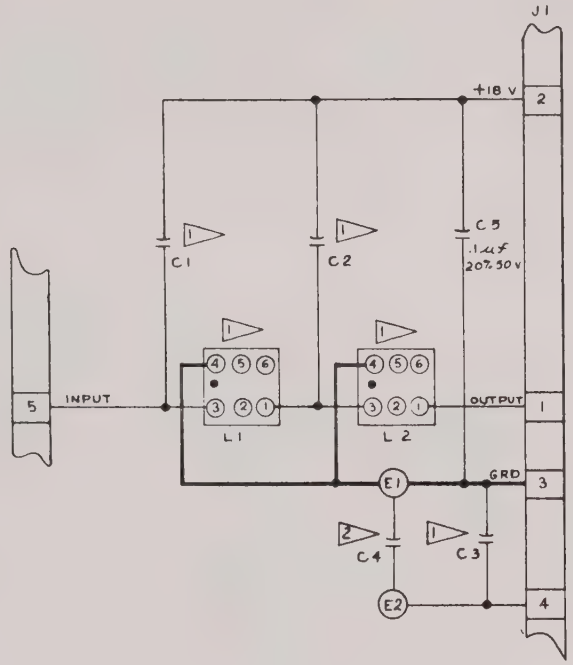
EDC

CONTRACT NO			REV
06141	C	7087	B
SHT 2 OF 1	209-E-00687	UNIT	SHT 1

EMR 2174 OZALID

COMPONENT CHART	
LAST NO USED	UNUSED NO
C 5	
E 2	
L 2	

REVISIONS				
SYM	DESCRIPTION	ENGINEERING RELEASE	DATE	APPROVED
A	ECO 35557 12-10-68	SEE ECO	12/10/68	DC
B	ECO		4-25-69	E.U.P



NOTES:

1. FREQUENCY VARIABLE
2. TEST VARIABLE

7159

7159

-2 REQUIRED	-1	BASIC	CAGE SIZE	PART NO	DESCRIPTION	PART CLASS	MFG CODE	ITEM OR SYM.
					LIST OF MATERIALS			

UNLESS OTHERWISE SPECIFIED
DECIMALS ANGLES FINISH
.XX = ± .03 ± 1°
.XXX = ± .010
ALL DIMENSIONS ARE IN INCHES
TOLERANCE ON MACHINED HOLES
BREAK SHARP EDGES AND BREAK SCRATCH MARK
DO NOT SCALE DRAWING

	NAME	DATE
DRAWN BY	P. S. Mason	7-10-68
DESIGNER		
CHECKED		
DESIGN ENGINEER		
PROJECT ENGINEER		
APPROVED		
APPROVED		

MATERIAL #

TREATMENT OR FINISH #

BSC 7087 4180-01

LOCATE ALL BOX AS SHOWN

EMR 3 2 348 OZALID

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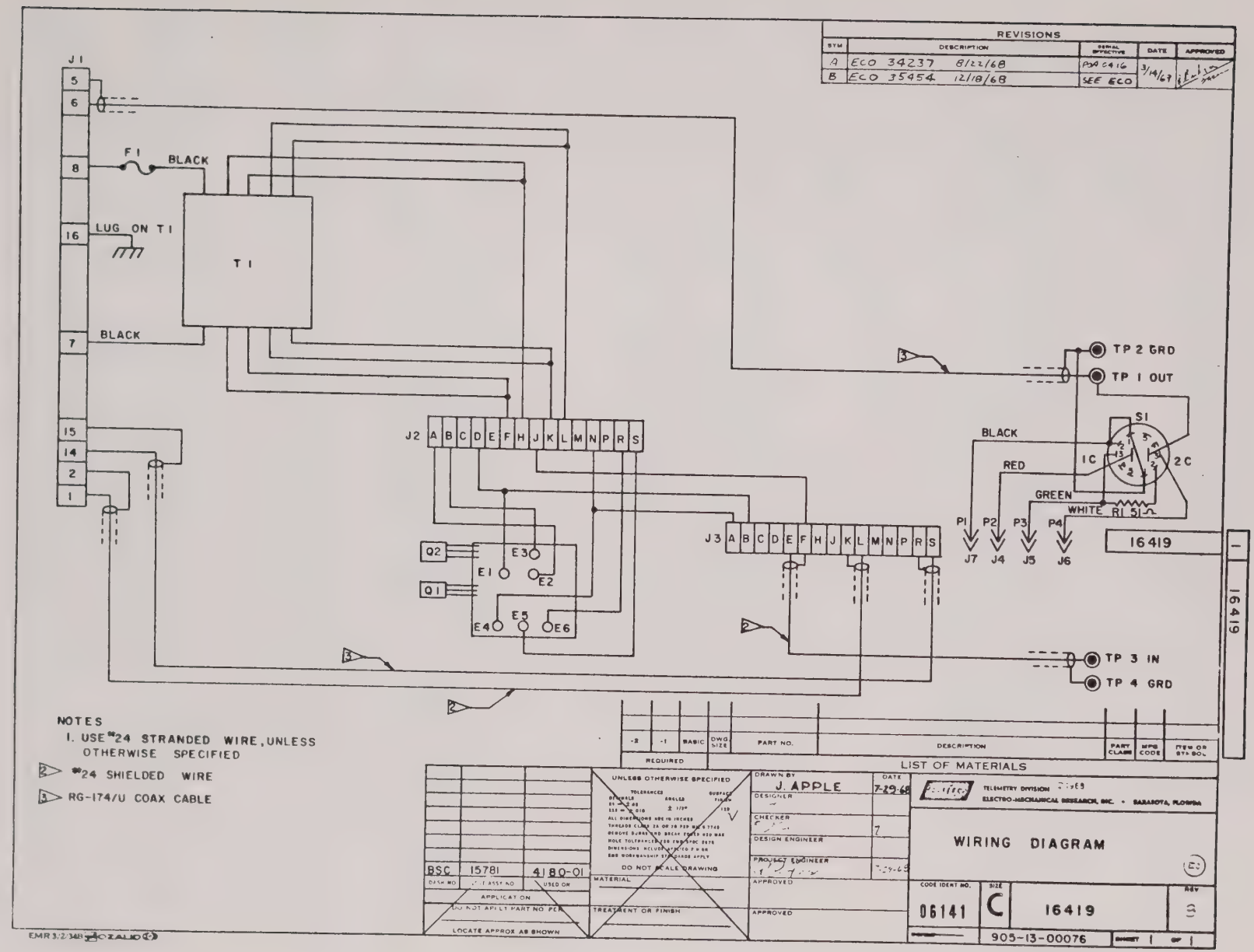
PRINTED-WIRING SCHEMATIC
LOW PASS OUTPUT FILTER (EDC)

CODE IDENT NO	SIZE	DWG NO	REV
06141	C	7159	B

SCALE # 905 01 00525 SHEET 1 OF 1


REVISIONS
SYM DESCRIPTION SERIAL EFFECTIVE DATE APPROVED
A ECO 34237 8/22/68 PXA 0416 3/14/69
B ECO 35454 12/18/68 SEE ECO
J1
5
6
8
16
7
15
14
2
1
F1
BLACK
LUG ON T1
T1
BLACK
J2 A B C D E F H J K L M N P R S
Q2
Q1
E1
E2
E3
E4
E5
E6
J3 A B C D E F H J K L M N P R S
TP 2 GRD
TP 1 OUT
S1
1C
2C
BLACK
RED
GREEN
WHITE
R1
P1
P2
P3
P4
J7
J4
J5
J6
16419
TP 3 IN
TP 4 GRD
NOTES
1. USE #24 STRANDED WIRE, UNLESS OTHERWISE SPECIFIED
2 #24 SHIELDED WIRE
3 RG-174/U COAX CABLE
-2 -1 BASIC DWG SIZE PART NO. DESCRIPTION PART CLASS MFG CODE ITEM OR SYMBOL
REQUIRED
LIST OF MATERIALS
UNLESS OTHERWISE SPECIFIED
DRAWN BY J. APPLE DATE 7-29-68
DESIGNER
CHECKER
DESIGN ENGINEER
PROJECT ENGINEER
DO NOT SCALE DRAWING
BSC 15781 4180-01
DASH NO. USED ON
APPLICATION
DO NOT APPLY PART NO PER
LOCATE APPROX AS SHOWN
MATERIAL
TREATMENT OR FINISH
APPROVED
APPROVED
TELEMETRY DIVISION
ELECTRO-MECHANICAL RESEARCH, INC. • SARASOTA, FLORIDA
WIRING DIAGRAM
CODE IDENT NO. 06141
SIZE C
16419
REV B
905-13-00076
SHEET 1 OF 1
EMR 3/2348

SECTION 6

PARTS LISTS AND RECOMMENDED SPARES

6.1 GENERAL

This section contains information concerning parts replacement, spares provisioning, and parts ordering for the EMR 4180. A complete list of the parts information is contained in Table 6-1 and described in paragraph 6.2. Recommended spares, spares provisioning information, and parts ordering information are contained in paragraphs 6.3, 6.4, and 6.5, respectively.

6.2 PARTS LISTS DESCRIPTION

6.2.1 Variable Chart

The variable chart, EMR drawing 16289, contains the top level parts information for the 4180. This drawing provides the complete model number of the unit and information describing the variable digits of the model number. The tables on the top of the model number illustrates all available versions of the 4180 and the corresponding model numbers. The lower left table under the model number contains EMR top assembly and parts list numbers. Knob, handle, and trim parts information is contained in the lower right table under the model number.

6.2.2 Parts Lists

The parts lists in this section are provided in descending order starting with the top assembly parts lists and continuing through all subassemblies and components. A complete tabulation of the parts lists and the order in which they appear in this section are contained in Table 6-1. Table 6-1 also contains the parts list number and the page number on which each parts list starts.

Each parts list number corresponds to the assembly number and drawing number in which the parts are illustrated. Drawings illustrating the parts in the parts lists are contained in Section 5 of this manual. For example, the parts listed in PL 15781 are illustrated on EMR drawing 15781 in Section 5.

The parts list for the top assembly (PL 15781) contains a listing of all subassemblies in the configuration. The subassemblies are identified by an item number in the ITEM NO. column. These item numbers correspond to numbers in the reference balloons on the top assembly drawing 15781.

The subassemblies are broken down in separate parts lists. Parts lists for the subassemblies are identified by the subassembly number in the DRAWING OR SPEC NO. column. Further parts list breakdown from this point is in the same manner.

Also included in the parts lists for each item is the quantity required (QTY. REQ'D), EMR PART NUMBER, DESCRIPTION, VENDOR NAME, and VENDOR PART NUMBER. The listings in the VENDOR NAME column are abbreviations for the particular vendors. These abbreviations and complete vendor identification are contained in Table 6-3. Any part listed in the parts lists may be ordered directly from EMR or may be purchased from the original vendor.

6.3 RECOMMENDED SPARES

A list of the recommended spare parts for the 4180 is contained in Table 6-2. The recommended spares, as listed in this Table, are based on the following conditions:

a. Operating time -- 8 hours/day, 5 days/week (2080 hours/year).

b. Operating temperature -- 0°C to 30°C.

c. User has capability to repair to the component level.

d. Failure rates are constant.

e. A 0.9 probability of being able to repair from the recommended complement for one year.

f. Equipment will be used as ground equipment (as opposed to vehicular or airborne).

The recommended spares table contains a PART DESCRIPTION column, an EMR STOCK NO. column, a VENDOR NAME column, a VENDOR PART NO. column, a TQ column which is the total quantity of the part in the unit, and an RS column which lists the number of recommended spares for the part. The listings in the VENDOR NAME column are abbreviations for the particular vendors. These abbreviations and complete vendor identification are described in Table 6-3.

6.4 PROVISIONING CONSIDERATIONS

The selection of an optimum spare parts complement involves a number of considerations known only to the user. These considerations include operating time and cycles, operating environment, number of equipments to be spared and their locations with respect to one another, urgency of returning an equipment to service, troubleshooting, repair and test capability, stock of commonly used parts, etc.

Sparing considerations known to EMR include mean-time-between-failures for parts and assemblies under various operating environments, prices, relative ease of troubleshooting, repair, retest, etc.

Table 6-4 lists the type of information required in order for EMR to recommend an optimum spare parts complement for specific operating and logistic situations. If the information outlined in Table 6-4 is supplied to EMR, a recommended list will be furnished at no cost for each individual situation.

6.5 ORDERING INSTRUCTIONS

When ordering parts, complete description of each part as listed in DESCRIPTION column of parts list must accompany order. Also included, must be the EMR stock number and vendor's name and part number.

Table 6-1. Parts List Breakdown

NAME	NUMBER	PAGE NO.
EMR 4180 Variable Chart	16289	6-5
EMR 4180 Top Assembly	PL 15781	6-6
Chassis Assembly	PL 16274-1	6-8
Front Panel Assembly	PL 16283	6-10
Regulator Card Assembly	PL 13680	6-11
Channel Selector Assembly	PL 17650	6-13
Discriminator Card Assembly	PL 15782	6-14
Input Filter Card Assembly	PL 7077	6-20
Low-pass Output Filter Card Assembly	PL 7087	6-24

REVISIONS				
DWG	DESCRIPTION	APPROVED	DATE	APPROVED
A	ECO 53963, ADDED 15893-1 TO -0-M OPT.	[illegible]	9-74	[illegible]

DESIGN SEQUENCE	
01	STANDARD

LPOF CHARACTERISTICS	
1	CONSTANT DELAY (CD)
2	CONSTANT AMP (CA)
9	SPECIAL

POWER OPTIONS	
0	105-132 V RMS, 47 to 65 Hz
7	105-132 V RMS, 360 to 440 Hz
8	230 V RMS ±10%, 47 to 63 Hz
9	SPECIAL

PAINT COLOR		
	FRONT PANEL	LETTERING
1	LIGHT GREEN (00048W)	WHITE
2	DARK GREEN (00049W)	WHITE
4	GRAY (26492B)	BLACK
9	SPECIAL	—

MODEL 4180-XX-X-XXXXX.XXX-XXXXX.XX-XXXXXXX.X-X-X

CENTER FREQUENCY (MHz) DEVIATION (±kHz or ±%) LOW PASS OUTPUT FILTER (Hz)

POWER OPTIONS		
999-01-00001		
	TRANSFORMER	
	DWG NO.	PT/ASSY NO.
0	15893	262 99 00067
7	15893	262 99 00067
8	15893-1	262-99-00098
9	—	—

LPOF CHARACTERISTICS		
999-02-00001		
	VARIABLE CHART	
	DWG NO.	PT/ASSY NO.
1	17647	905-05-00176
2	16738	905-05-00179
9	—	—

DISCR HIGH FREQ			
	ASSY NO	PARTS LIST	PT/ASSY NO.
01	15781	PL-15781	089-89-00039

	999-03-00001 KNOB			999-03-00002 HANDLE			999-03-00003 TRIM		
	DWG NO.	COLOR	PT/ASSY NO.	DWG NO.	COLOR	PT/ASSY NO.	DWG NO.	COLOR	PT/ASSY NO.
1	6076	LT GRN	148-99-00014	5860-1	DK GRN	128-99-00006	6011	POLISH	246-99-00011
2	6076-1	DK GRN	148-99-00022	5860-1	DK GRN	128-99-00006	6011	POLISH	246-99-00011
4	6076-2	BLACK	148-99-00023	5860-2	BLACK	128-99-00007	6011-1	BLACK	246-99-00012

LIST OF MATERIALS

QTY REQUIRED	UNIT	BASIC DIM	DIM TOL	PART NO	DESCRIPTION	PART CLASS	MFG CODE
—	—	—	—	15781	J-BOX		

UNLESS OTHERWISE SPECIFIED — DRAWN 9/11/67 — CHECKED 9-11-67 — ENGINEER 9-11-67 — PROJECT ENGINEER 9-11-67 — APPROVED — DO NOT SCALE DRAWING

MATERIAL — TREATMENT OR FINISH — APPROVED

APPLICATION — DO NOT APPLY AT ASSY NO. — LOCATE ASSYS AS SHOWN

EMR — ELECTRO-MECHANICAL RESEARCH, INC. — CHANNELVIEW, TEXAS

VARIABLE CHART
MODEL 4180

CAGE DRAW NO.	SIZE	DRAWING NO.	REV
06141	D	16289	A

SCALE None — 905-05-00148 — SHEET 1 OF 1

E M R - T E L E M E T R Y

PARTS LIST 15781 REV DATE 02/10/71 REV LTR K

LIST TITLE DISCR,ASSY,HIGH FREQ CHGE CONT NO. CODE IDENT SHT 1 OF 1
PART NO. 089-89-00039 ECO 41784 06141 CKD BY

ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER	USAGE
1	1	042-89-00095	16274-1	CHAS,ASSY	EMR	042-89-00095	
2	1	191-89-00258	16283	PANEL,ASSY,FRONT	EMR	191-89-00258	
3	1	999-03-00001	16289	KNOB,POA VAR			
4	1	075-89-00012	6650	COVER,ASSY	EMR	075-89-00012	
5	1	205-89-00392	13680	PWA,REGULATOR	EMR	205-89-00392	
6	1	205-89-00701	17650	PWA,CHANNEL SELECTOR	EMR	205-89-00701	
7	2	287-02-00016		NUT,HEX,4-40 SST	QVL	NAS 671-C4	
8	6	273-02-00046		WASHER,#4,FLAT,SS	QVL	NAS620C4	
9	6	273-02-00025		WASHER,#4,INT TOOTH	PRCMT OPTION	MS35333-70	
10	4	229-02-00073		SCREW,4-40X1/4 PAN HD	PRCMT OPTION	MS51957-13	* P
11	2	229-02-00072		SCREW,4-40X3/16 PAN HD	PRCMT OPTION	MS51957-12	* P
12	AR	060-11-00001		CMPD,LOCKING,FINE THREAD	LOCTITE CORP	LOCTITE GRADE A	
14	1	205-89-00687	7087	PWA,LOW PASS	EMR	205-89-00687	
16	1	229-02-00075		SCREW,4-40X3/8 PAN HD	PRCMT OPTION	MS51957-15	* P
17	3	239-98-00047		SPACER,1/4D X1/4L #8	AMATOM	9224-PH-171-0	
20	1	616-02-05109		RES,51 OHM 5% 1/4W	ALLEN BRAD	RC07GF510J	
21	1	196-99-00156	10663	PLATE,NAME EQUIP IDENT	EMR	196-99-00156	
P 1 THRU P 4	4	065-98-00014		CONT,PIN	USECO	7710	
REF 1	1	905-05-00144	16289	VARIABLE CHART	EMR	905-05-00144	
REF 2	1	905-13-00076	16419	WIRING DIAGRAM	EMR	905-13-00076	
REF 3	1	905-07-00144	17181	SPEC,ENG,MODEL 4180	EMR	905-07-00144	
REF 4	1	905-06-00093	17182	SPEC,TEST	EMR	905-06-00093	

FIRST USAGE MODEL 4180

E M R - T E L E M E T R Y

PARTS LIST 16274-1 REV DATE 04/12/76 REV LTR F

LIST TITLE CHAS,ASSY CHGE CONT NO. CODE IDENT SHT 1 OF 1
PART NO. 042-89-00095 ECO RECORD 1 06141 CKD BY

ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER	USAGE
1	1	042-89-00097	16275	CHAS,ASSY,WELDMENT	EMR	042-89-00097	
2	1	204-89-00182	15725	PWB,TRANSISTOR	EMR	204-89-00182	
3	1	250-89-00020	8009-1	SWITCH ROT 2 P/2-5 POS	EMR	250-89-00020	
4	1	999-01-00001	16289	XFMR,POA VAR			
5	1	063-98-00042		CONN,PLUG,16PIN,R&P	AMPHENOL	26-159-16	
6	2	063-98-00046		CONN,RECP,15PIN@.156,PWB	CINCH	250-15-30-171	
7	1	134-98-00023		HOLDER,FUSE 5A FR PNL MT	LITTELFUSE	281006	
8	1	120-98-00037		FUSE,MICRO,1/2 AMP 125V	LITTELFUSE	273.500	
9	AR	287-02-00002		NUT,HEX, 4-40	PRCMT OPTION	MS35649-244	
10	2	229-02-00073		SCREW,4-40X1/4 PAN HD	PRCMT OPTION	MS51957-13	* P
11	5	273-02-00004		WASHER,#4, FLT ST STL	PRCMT OPTION	MS15795-803	
12	7	273-02-00025		WASHER,#4,INT TOOTH	PRCMT OPTION	MS35333-70	
13	4	229-02-00106		SCREW,8-32X7/8 PAN HD	PRCMT OPTION	MS51957-48	* P
14	4	273-02-00008		WASHER,#8, FLT ST STL	PRCMT OPTION	MS15795-807	
15	4	273-02-00027		WASHER,#8,INT TOOTH	PRCMT OPTION	MS35333-72	
16	1	255-98-00113		TERM.,#8,SOLDER LUG,LKG	SHAKEPROOF	2101-08-00	
17	2	273-02-00046		WASHER,#4,FLAT,SS	QVL	NAS620C4	
18	AR	268-98-00013		TUBING,.750ID,SHRINK	ALPHA WIRE	FIT-105-3/4*BLACK*	
19	4	229-02-00077		SCREW,4-40X1/2 PAN HD	PRCMT OPTION	MS51957-17	* P
20	AR	276-98-00123		WIRE,#24,STRD,SHLD/JKT	QVL	NAS-703-24-SJ-C-9	
21	AR	024-02-00001		CABLE,COAXIAL,50 OHM,.100	QPL-17	RG-174/U	
22	1	239-98-00001		SPACER,1/4DX1/16L,#6	RCHRD ARCRFT	BY DESCRIPTION	
23	AR	276-02-00011		WIRE,#24,STRD,BLK/WHT	PRCMT OPTION	MIL-W-16878/4*STL CTD*	
24	AR	287-02-00016		NUT,HEX,4-40 SST	QVL	NAS 671-C4	
Q 1	1	263-10-49210		XSTR SW-AMP 40V 1A 30W	JEDEC	2N4921	
Q 2	1	263-10-49180		XSTR SW-AMP 40V 1A 30W	JEDEC	2N4918	
REF 1	1	905-13-00076	16419	WIRING DIAGRAM	EMR	905-13-00076	

FIRST USAGE MODEL 4180

E M R - T E L E M E T R Y

PARTS LIST 16283 REV DATE 04/16/76 REV LTR A

LIST TITLE PANEL,ASSY,FRONT CHGE CONT NO. CODE IDENT SHT 1 OF 1
PART NO. 191-89-00258 ECO RECORD 1 06141 CKD BY

ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER	USAGE
1	1	191-89-00257	16282	PANEL,ASSY,FRONT	EMR	191-89-00257	
2	1	999-03-00003	16289	STRIP,POA VAR			
3	2	412-99-00007	15718	IDENT,RET	EMR	412-99-00007	
4	1	016-99-00041	6012	BRKT, LOCATING	EMR	016-99-00041	
5	4	143-98-00006		JACK,TEST PT,PNL TYPE,WHT	MNL 16	016-8010-209	* P
6	2	229-98-00157		SCREW,DR,RND HD, 0X3/16	PRCMT OPTION	BY DESCRIPTION	
7	7	229-98-00155		SCREW,DR,RND HD,00X3/16	PRCMT OPTION	BY DESCRIPTION	
8	1	999-03-00002	16289	HANDLE,POA VAR			
9	1	127-98-00008		GROM,NYLATCH,BLK,.162 SH	HARTWELL	H559-4-1	
REF 1	1	905-10-00239	MYL-16418	ARTWORK,FRONT PANEL	EMR	905-10-00239	

FIRST USAGE MODEL 4180

E M R - T E L E M E T R Y

PARTS LIST 13680 REV DATE 03/14/74 REV LTR E

LIST TITLE PWA,REGULATOR CHGE CONT NO. CODE IDENT SHT 1 OF 1
PART NO. 205-89-00392 ECO RECORD 1 06141 CKD BY

ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER	USAGE
1	1	204-89-00167	13679	PWB,REGULATOR	EMR	204-89-00167	
2	6	189-98-00004		PAD,XSTR 4 PIN*USE OPTL*	DEL BLINN	100-000-NY	
C 1	1	354-63-50005		CAP., 500MF -10&75% 40V	SPRAGUE/MML6	39D507G040GJ4/TVA-1315	
C 2	1	336-14-10003	601	CAP. 1.0MF 10% 35V	EMR	336-14-10003	
C 3	1	336-14-10003	601	CAP. 1.0MF 10% 35V	EMR	336-14-10003	
C 4	1	354-63-50005		CAP., 500MF -10&75% 40V	SPRAGUE/MML6	39D507G040GJ4/TVA-1315	
C 5	1	337-14-68003	601	CAP. 6.8MF 10% 35V	EMR	337-14-68003	
C 6	1	337-14-68003	601	CAP. 6.8MF 10% 35V	EMR	337-14-68003	
CR 1	1	214-98-00003		RECT,BRDG FW, 1.0A,100V	MOT	MDA920A-3	* Q
CR 2	1	088-10-41480		DIODE,SW,75V/5UA,4NS/10MA	JEDEC	1N4148	
CR 3	1	088-10-40020		DIODE,RECTIFIER 100V,1A,I	JEDEC	1N4002	
CR 4	1	088-10-09360		DIODE,REF,9V/7.5MA,.005 %	MML 2	1N936/1N936A/1N936B	
CR 5	1	088-10-09360		DIODE,REF,9V/7.5MA,.005 %	MML 2	1N936/1N936A/1N936B	
CR 6	1	088-10-40020		DIODE,RECTIFIER 100V,1A,I	JEDEC	1N4002	
CR 7	1	214-98-00003		RECT,BRDG FW, 1.0A,100V	MOT	MDA920A-3	* Q
CR 8	1	088-10-41480		DIODE,SW,75V/5UA,4NS/10MA	JEDEC	1N4148	
F 1	1	120-98-00019		FUSE,SLO-BLO,1/2AMP,125V	LITTELFUSE	313.500	
F 2	1	120-98-00019		FUSE,SLO-BLO,1/2AMP,125V	LITTELFUSE	313.500	
Q 1	1	263-97-00093		XSTR,PNP,SWITCH/AMPL,50V	MML 4	2N3251/2N3251A	
Q 2	1	263-10-39470		XSTR,NPN 40V SW-AMPL,HFE	JEDEC	2N3947	
Q 3	1	263-10-39470		XSTR,NPN 40V SW-AMPL,HFE	JEDEC	2N3947	
Q 4	1	263-97-00093		XSTR,PNP,SWITCH/AMPL,50V	MML 4	2N3251/2N3251A	
Q 5	1	263-97-00093		XSTR,PNP,SWITCH/AMPL,50V	MML 4	2N3251/2N3251A	
Q 6	1	263-10-39470		XSTR,NPN 40V SW-AMPL,HFE	JEDEC	2N3947	
R 1	1	620-02-10001		RES, 10K 5% 1/8W	ALLEN BRAD	RC05GF103J	
R 2	1	608-09-10001	624	RES. 10K 1% 1/10W	EMR	608-09-10001	* P
R 3	1	616-02-10001		RES,10K 5% 1/4W	ALLEN BRAD	RC07GF103J	
R 4	1	616-02-15000		RES,1.5K 5% 1/4W	ALLEN BRAD	RC07GF152J	
R 5	1	616-02-10004		RES,10 MEG 5% 1/4W	ALLEN BRAD	RC07GF106J	
R 7	1	620-02-20000		RES., 2K 5% 1/8W	ALLEN BRAD	RC05GF202J	
R 8	1	620-02-91000		RES, 9.1K 5% 1/8W	ALLEN BRAD	RC05GF912J	
R 10	1	620-02-20000		RES., 2K 5% 1/8W	ALLEN BRAD	RC05GF202J	
R 11	1	620-02-91000		RES, 9.1K 5% 1/8W	ALLEN BRAD	RC05GF912J	
R 13	1	616-02-10001		RES,10K 5% 1/4W	ALLEN BRAD	RC07GF103J	
R 14	1	616-02-15000		RES,1.5K 5% 1/4W	ALLEN BRAD	RC07GF152J	
R 15	1	616-02-10004		RES,10 MEG 5% 1/4W	ALLEN BRAD	RC07GF106J	
R 17	1	608-09-10001	624	RES. 10K 1% 1/10W	EMR	608-09-10001	* P
R 18	1	620-02-10001		RES, 10K 5% 1/8W	ALLEN BRAD	RC05GF103J	
R 9A	1	608-09-00000	624	RES,*T/VAR* 1% 1/10W			
R 9B	1	616-02-00000		RES,*T/VAR* 5% 1/4W			
R 12A	1	608-09-00000	624	RES,*T/VAR* 1% 1/10W			
R 12B	1	616-02-00000		RES,*T/VAR* 5% 1/4W			
REF 1	1	905-01-00325	13678	SCHEMATIC,PWA	EMR	905-01-00325	
REF 2	1	905-04-00001	9500	SPEC,COMPONENT SPACING	EMR	905-04-00001	

FIRST USAGE MODEL 4580

E M R - T E L E M E T R Y

PARTS LIST 17650 REV DATE 12/31/70 REV LTR B

LIST TITLE PWA,CHANNEL SELECTOR CHGE CONT NO. CODE IDENT SHT 1 OF 1
PART NO. 205-89-00701 ECO 41749 06141 CKD BY

ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER	USAGE
1	1	205-89-00688	15782	PWA,DISCRIMINATOR	EMR	205-89-00688	
2	1	205-89-00468	7077	PWA,INPUT FILTER	EMR	205-89-00468	
3	1	075-89-00049	16424	COVER,ASSY,SHIELD	EMR	075-89-00049	
4	2	273-02-00046		WASHER,#4,FLAT,SS	QVL	NAS620C4	
5	2	273-02-00025		WASHER,#4,INT TOOTH	PRCMT OPTION	MS35333-70	
6	2	229-02-00073		SCREW,4-40X1/4 PAN HD	PRCMT OPTION	MS51957-13	* P
7	4	229-02-00063		SCREW,2-56X1/8 PAN HD	PRCMT OPTION	MS51957-1	* P
8	4	273-02-00003		WASHER,#2, FLT ST STL	PRCMT OPTION	MS15795-802	

FIRST USAGE MODEL 4181

EMR - TELEMETRY

PARTS LIST 15782 REV DATE 08/20/77 REV LTR N

LIST TITLE PWA,DISCRIMINATOR CHGE CONT NO. CODE IDENT SHT 1 OF 3
PART NO. 205-89-00688 ECO RECORD 1 06141 CKD BY

ITEM NO.	QTY REQD	EMR NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER	USAGE
1	1	204-89-00271	15783	PWB,DISCRIMINATOR	EMR	204-89-00271	
2	12	065-98-00045		CONT,PIN,.025SQ, .620L	BERG ELECT	75481-014	
3	1	298-98-00008		HTSK,FOR TO-5 PKG	IERC	TXBF-032-0258	
4	20	189-98-00004		PAD,XSTR 4 PIN*USE OPTL*	DEL BLINN	100-000-NY	
5	3	189-99-00001	800-1	PAD,XSTR TO-5,9 OR 11,4 P	EMR	189-99-00001	
6	1	232-99-00041	16295	SHIELD	EMR	232-99-00041	
7	2	239-99-00057	16293	SPACER,RESISTOR	EMR	239-99-00057	
8	1	298-98-00007		HTSK,FAN TOP	IERC	TXC-20B OR TXC-20U	
9	AR	276-98-00102		WIRE,#24,STRD,WHT,600V	MML42	NAS-703-24-U-C-9	
10	3	421-98-00001		INSERT,THREADED,4-40NC-2	BOOTS A/C	BL 4807-440A	* Q
12	1	412-99-00006	15719	IDENT	EMR	412-99-00006	
13	1	239-98-00001		SPACER,1/4DX1/16L,#6	RCHRD ARCRFT	BY DESCRIPTION	
14	AR	060-11-00010		CMPD,ADHESIVE,FAST SET	EASTMAN	910	
C 1 THRU	4	301-13-10002		CAP, .1UF 20% 50V LS.200	MML 48	8131-050-651-104M/MML	
C 4							
C 5	1	337-14-68003	601	CAP. 6.8MF 10% 35V	EMR	337-14-68003	
C 6 THRU	6	301-13-10002		CAP, .1UF 20% 50V LS.200	MML 48	8131-050-651-104M/MML	
C 11							
C 12	1	999-01-00001	7033	CAP.,*F/VAR*			
C 13	1	999-01-00001	7033	CAP.,*F/VAR*			
C 14	1	304-13-05109	600	CAP. 51PF 1% 500V	EMR	304-13-05109	
C 15	1	301-13-10002		CAP, .1UF 20% 50V LS.200	MML 48	8131-050-651-104M/MML	
C 16	1	301-13-10002		CAP, .1UF 20% 50V LS.200	MML 48	8131-050-651-104M/MML	
C 17	1	999-01-00003	7033	CAP.,*F/VAR*			
C 18	1	999-01-00003	7033	CAP.,*F/VAR*			
C 19	1	301-13-10002		CAP, .1UF 20% 50V LS.200	MML 48	8131-050-651-104M/MML	
C 20	1	999-01-00005	7033	CAP.,*F/VAR*			
C 21 THRU	3	336-14-10003	601	CAP. 1.0MF 10% 35V	EMR	336-14-10003	
C 23							
C 24	1	339-14-47004	601	CAP., 47MF 10% 35V	EMR	339-14-47004	
C 25	1	301-13-10002		CAP, .1UF 20% 50V LS.200	MML 48	8131-050-651-104M/MML	
C 26	1	304-00-00000	15782	CAP., *T/VAR*			
CR 1 THRU	3	088-10-41480		DIODE,SW,75V/5UA,4NS/10MA	JEDEC	1N4148	
CR 3							
CR 4	1	088-99-00379	642-11	DIODE,ZENER 0.4W 9.1V	EMR	088-99-00379	
CR 5	1	088-10-47361		DIODE,ZENER 1.0W 6.8V	MML64	1N4736A	
CR 6	1	088-10-41480		DIODE,SW,75V/5UA,4NS/10MA	JEDEC	1N4148	
CR 7	1	088-99-00209	642-10	DIODE,ZENER 0.4W 8.2V	EMR	088-99-00209	
CR 8	1	088-99-00209	642-10	DIODE,ZENER 0.4W 8.2V	EMR	088-99-00209	
Q 1 THRU	8	263-10-39330		XSTR,NPN 30V VHF/UHF AMPL	JEDEC	2N3933	* Q
Q 8							

FIRST USAGE MODEL 4180-01

(Revision C)

ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER	USAGE
Q 9	1	263-97-00099		XSTR,NPN HIGH FREQ.AMPL	MML4	2N918	
Q 10	1	263-97-00099		XSTR,NPN HIGH FREQ.AMPL	MML4	2N918	
Q 11	1	263-10-39330		XSTR,NPN 30V VHF/UHF AMPL	JEDEC	2N3933	* Q
Q 12	1	263-10-39330		XSTR,NPN 30V VHF/UHF AMPL	JEDEC	2N3933	
Q 13	1	263-97-00093		XSTR,PNP,SWITCH/AMPL,50V	MML 4	2N3251/2N3251A	
Q 14	1	263-10-39330		XSTR,NPN 30V VHF/UHF AMPL	JEDEC	2N3933	* Q
Q 15	1	263-10-39330		XSTR,NPN 30V VHF/UHF AMPL	JEDEC	2N3933	
Q 16	1	263-97-00093		XSTR,PNP,SWITCH/AMPL,50V	MML 4	2N3251/2N3251A	
Q 17	1	263-10-39330		XSTR,NPN 30V VHF/UHF AMPL	JEDEC	2N3933	* Q
Q 18	1	263-10-39330		XSTR,NPN 30V VHF/UHF AMPL	JEDEC	2N3933	
Q 20	1	263-97-00093		XSTR,PNP,SWITCH/AMPL,50V	MML 4	2N3251/2N3251A	
Q 21	1	263-97-00093		XSTR,PNP,SWITCH/AMPL,50V	MML 4	2N3251/2N3251A	
Q 22	1	263-10-06970		XSTR,NPN 100MHZ SW,VCB 60	JEDEC	2N697	
Q 23	1	263-10-06970		XSTR,NPN 100MHZ SW,VCB 60	JEDEC	2N697	
Q 24	1	263-10-11320		XSTR,PNP,90MHZ AMP-OSC-SW	JEDEC	2N1132	
R 3	1	616-02-16000		RES,1.6K 5% 1/4W	ALLEN BRAD	RC07GF162J	
R 4	1	616-02-10009		RES,100 OHM 5% 1/4W	ALLEN BRAD	RC07GF101J	
R 5	1	616-02-16000		RES,1.6K 5% 1/4W	ALLEN BRAD	RC07GF162J	
R 6	1	616-02-75009		RES,750 OHM 5% 1/4W	ALLEN BRAD	RC07GF751J	
R 7	1	616-02-75009		RES,750 OHM 5% 1/4W	ALLEN BRAD	RC07GF751J	
R 8	1	616-02-10001		RES,10K 5% 1/4W	ALLEN BRAD	RC07GF103J	
R 9	1	605-09-19609	625	RES. 196 OHM 1% 1/8W	EMR	605-09-19609	
R 10	1	605-09-12109	625	RES. 121 OHM 1% 1/8W	EMR	605-09-12109	
R 11	1	605-09-19609	625	RES. 196 OHM 1% 1/8W	EMR	605-09-19609	
R 12	1	605-09-12109	625	RES. 121 OHM 1% 1/8W	EMR	605-09-12109	
R 13	1	616-02-10001		RES,10K 5% 1/4W	ALLEN BRAD	RC07GF103J	
R 14	1	616-02-15001		RES,15K 5% 1/4W	ALLEN BRAD	RC07GF153J	
R 15	1	616-02-15001		RES,15K 5% 1/4W	ALLEN BRAD	RC07GF153J	
R 16	1	999-01-00006	7033	RES,*T/VAR*			
R 17	1	616-02-00000		RES,*T/VAR* 5% 1/4W			
R 18	1	605-09-10000	625	RES. 1K 1% 1/8W	EMR	605-09-10000	
R 19	1	616-02-51009		RES,510 OHM 5% 1/4W	ALLEN BRAD	RC07GF511J	
R 20	1	616-02-10009		RES,100 OHM 5% 1/4W	ALLEN BRAD	RC07GF101J	
R 21	1	616-02-10009		RES,100 OHM 5% 1/4W	ALLEN BRAD	RC07GF101J	
R 22	1	616-02-51009		RES,510 OHM 5% 1/4W	ALLEN BRAD	RC07GF511J	
R 23	1	616-02-16000		RES,1.6K 5% 1/4W	ALLEN BRAD	RC07GF162J	
R 24	1	616-02-18000		RES,1.8K 5% 1/4W	ALLEN BRAD	RC07GF182J	
R 25	1	616-02-15009		RES,150 OHM 5% 1/4W	ALLEN BRAD	RC07GF151J	
R 26	1	616-02-51009		RES,510 OHM 5% 1/4W	ALLEN BRAD	RC07GF511J	
R 27	1	616-02-10009		RES,100 OHM 5% 1/4W	ALLEN BRAD	RC07GF101J	
R 29	1	616-02-18000		RES,1.8K 5% 1/4W	ALLEN BRAD	RC07GF182J	
R 30	1	616-02-10009		RES,100 OHM 5% 1/4W	ALLEN BRAD	RC07GF101J	
R 31	1	616-02-51009		RES,510 OHM 5% 1/4W	ALLEN BRAD	RC07GF511J	
R 32	1	616-02-18000		RES,1.8K 5% 1/4W	ALLEN BRAD	RC07GF182J	
R 33	1	616-02-10009		RES,100 OHM 5% 1/4W	ALLEN BRAD	RC07GF101J	
R 34	1	616-02-20009		RES,200 OHM 5% 1/4W	ALLEN BRAD	RC07GF201J	
R 35	1	609-09-00000		RES,*T/VAR* 1% 1/8W			
R 36	1	413-98-00009		THMS,470 OHM 5% 1/4W	T.I.	TM-1/4	
R 37	1	616-02-20009		RES,200 OHM 5% 1/4W	ALLEN BRAD	RC07GF201J	

FIRST USAGE MODEL 4180-01

ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER	USAGE
R 38	1	622-02-27000		RES. 2.7K 5% 1/2W	ALLEN BRAD	RC20GF272J	
R 39	1	622-02-27000		RES. 2.7K 5% 1/2W	ALLEN BRAD	RC20GF272J	
R 40	1	605-09-24909	625	RES. 249 OHM 1% 1/8W	EMR	605-09-24909	
R 41	1	605-09-24909	625	RES. 249 OHM 1% 1/8W	EMR	605-09-24909	
R 42	1	616-02-12009		RES,120 OHM 5% 1/4W	ALLEN BRAD	RC07GF121J	
R 43	1	616-02-12009		RES,120 OHM 5% 1/4W	ALLEN BRAD	RC07GF121J	
R 44	1	616-02-24000		RES,2.4K 5% 1/4W	ALLEN BRAD	RC07GF242J	
R 45	1	201-98-00151		POT.,2K 10% CERMET,100PPM	BECKMAN	78PR2K	* Q
R 46	1	201-98-00152		POT.,10K CERMET,100PPM	BECKMAN	78PR10K	* Q
R 47	1	616-02-10009		RES,100 OHM 5% 1/4W	ALLEN BRAD	RC07GF101J	
R 48	1	616-02-10000		RES,1K 5% 1/4W	ALLEN BRAD	RC07GF102J	
R 49	1	605-09-00000		RES,*T/VAR* 1% 1/8W			
R 51	1	608-09-10001	624	RES. 10K 1% 1/10W	EMR	608-09-10001	* P
R 52	1	616-02-10009		RES,100 OHM 5% 1/4W	ALLEN BRAD	RC07GF101J	
R 53	1	616-02-18000		RES,1.8K 5% 1/4W	ALLEN BRAD	RC07GF182J	
R 54	1	616-02-20009		RES,200 OHM 5% 1/4W	ALLEN BRAD	RC07GF201J	
R 55	1	616-02-10009		RES,100 OHM 5% 1/4W	ALLEN BRAD	RC07GF101J	
R 56	1	201-98-00092		POT,TRMR, 2.0 K 10% .5W	BECK/MML27	62PR2K	* K
R 57	1	616-02-33000		RES,3.3K 5% 1/4W	ALLEN BRAD	RC07GF332J	
R 58	1	616-02-51000		RES,5.1K 5% 1/4W	ALLEN BRAD	RC07GF512J	
R 59	1	616-02-15009		RES,150 OHM 5% 1/4W	ALLEN BRAD	RC07GF151J	
R 60	1	616-02-15009		RES,150 OHM 5% 1/4W	ALLEN BRAD	RC07GF151J	
R 61	1	616-02-20009		RES,200 OHM 5% 1/4W	ALLEN BRAD	RC07GF201J	
R 62	1	616-02-20009		RES,200 OHM 5% 1/4W	ALLEN BRAD	RC07GF201J	
R 63	1	616-02-01009		RES,10 OHM 5% 1/4W	ALLEN BRAD	RC07GF100J	
R 64	1	616-02-01009		RES,10 OHM 5% 1/4W	ALLEN BRAD	RC07GF100J	
R 65	1	616-02-20000		RES,2K 5% 1/4W	ALLEN BRAD	RC07GF202J	
R 66	1	623-02-18009		RES., 180 OHM 5% 1W	ALLEN BRAD	RC32GF181J	
R 67	1	622-02-04709		RES, 47 OHM 5% 1/2W	ALLEN BRAD	RC20GF470J	
R 68	1	622-02-05609		RES, 56 OHM 5% 1/2W	ALLEN BRAD	RC20GF560J	
R 69	1	616-02-51009		RES,510 OHM 5% 1/4W	ALLEN BRAD	RC07GF511J	
R 70	1	616-02-10000		RES,1K 5% 1/4W	ALLEN BRAD	RC07GF102J	
R 71 THRU R 73	3	616-02-10009		RES,100 OHM 5% 1/4W	ALLEN BRAD	RC07GF101J	
REF 1	1	905-04-00002	9500-1	SPEC,COMPONENT SPACING	EMR	905-04-00002	
REF 2	1	905-01-00522	15784	SCHEMATIC,DISCRIMINATOR	EMR	905-01-00522	
REF 3	1	905-05-00175	7033	VARIABLE CHART	EMR	905-05-00175	

FIRST USAGE MODEL 4180-01

PARTS LIST 7077 REV DATE 11/09/74 REV LTR K

LIST TITLE PWA,INPUT FILTER CHGE CONT NO. CODE IDENT SHT 1 OF 2
PART NO. 205-89-00468 ECO 50434 06141 CKD BY

ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER	USAGE
1	1	204-89-00273	7078	PWB,INPUT FILTER	EMR	204-89-00273	
2	10	189-98-00004		PAD,XSTR 4 PIN*USE OPTL*	DEL BLINN	100-000-NY	
3	1	273-02-00003		WASHER,#2, FLT ST STL	PRCMT OPTION	MS15795-802	
4	1	229-02-00065		SCREW,2-56X1/4 PAN HD	PRCMT OPTION	MS51957-3	* P
5	7	065-98-00012		CONT,PCB MOUNT RECEPTACLE	AMP	85861-4	
6	AR	276-98-00102		WIRE,#24,STRD,WHT,600V	MML42	NAS-703-24-U-C-9	
C 1	1	999-01-00005	7083	CAP.,*FREQ/VAR*			
C 2	1	999-01-00006	7083	CAP.,*FREQ/VAR*			
C 3	1	999-01-00007	7083	CAP.,*FREQ/VAR*			
C 4	1	999-01-00005	7083	CAP.,*FREQ/VAR*			
C 5	1	999-01-00009	7083	CAP.,*FREQ/VAR*			
C 6 THRU C 8	3	301-13-10002		CAP, .1UF 20% 50V LS.200	MML 48	8131-050-651-104M/MML	
C 9	1	999-02-00001	7083	CAP., DEV/VAR			
C 10 THRU C 12	3	301-13-10002		CAP, .1UF 20% 50V LS.200	MML 48	8131-050-651-104M/MML	
C 13	1	999-02-00002	7083	CAP., DEV/VAR			
C 14	1	999-02-00003	7083	CAP., DEV/VAR			
C 15 THRU C 17	3	301-13-10002		CAP, .1UF 20% 50V LS.200	MML 48	8131-050-651-104M/MML	
C 18	1	999-02-00004	7083	CAP., DEV/VAR			
C 19	1	999-02-00005	7083	CAP., DEV/VAR			
C 20	1	301-13-10002		CAP, .1UF 20% 50V LS.200	MML 48	8131-050-651-104M/MML	
L 1	1	999-01-00001	7083	L,*FREQ/VAR*			
L 2	1	999-01-00002	7083	L,*FREQ/VAR*			
L 3	1	999-01-00002	7083	L,*FREQ/VAR*			
L 4	1	999-01-00004	7083	L,*FREQ/VAR*			
Q 1 THRU Q 4	4	263-10-39330		XSTR,NPN 30V VHF/UHF AMPL	JEDEC	2N3933	* Q
Q 5	1	999-02-00006	7083	XSTR,DEV/VAR			
Q 6	1	999-02-00007	7083	XSTR,DEV/VAR			
Q 7	1	999-02-00008	7083	XSTR,DEV/VAR			
Q 8	1	999-02-00009	7083	XSTR,DEV/VAR			
Q 9	1	263-10-39330		XSTR,NPN 30V VHF/UHF AMPL	JEDEC	2N3933	* Q
Q 10	1	263-10-39330		XSTR,NPN 30V VHF/UHF AMPL	JEDEC	2N3933	
R 1	1	999-01-00010	7083	RES,*FREQ/VAR*			
R 2	1	999-01-00011	7083	RES,*FREQ/VAR*			
R 3	1	999-01-00012	7083	RES,*FREQ/VAR*			
R 4	1	999-01-00013	7083	RES,*FREQ/VAR*			
R 5 THRU R 9	5	616-02-01009		RES,10 OHM 5% 1/4W	ALLEN BRAD	RC07GF100J	

FIRST USAGE MODEL 4180-01

ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER	USAGE
R 10	1	616-02-20000		RES,2K 5% 1/4W	ALLEN BRAD	RC07GF202J	
R 11	1	999-02-00010	7083	RES,DEV/VAR			
R 12	1	616-02-10009		RES,100 OHM 5% 1/4W	ALLEN BRAD	RC07GF101J	
R 13	1	616-02-10000		RES,1K 5% 1/4W	ALLEN BRAD	RC07GF102J	
R 14	3	616-02-20009		RES,200 OHM 5% 1/4W	ALLEN BRAD	RC07GF201J	
THRU							
R 16							
R 17	1	999-02-00011	7083	RES,DEV/VAR			
R 18	1	999-02-00012	7083	RES,DEV/VAR			
R 19	1	616-02-10000		RES,1K 5% 1/4W	ALLEN BRAD	RC07GF102J	
R 20	1	616-02-20000		RES,2K 5% 1/4W	ALLEN BRAD	RC07GF202J	
R 21	1	999-01-00014	7083	RES,*FREQ/VAR*			
R 22	1	616-02-20000		RES,2K 5% 1/4W	ALLEN BRAD	RC07GF202J	
R 23	1	620-02-20009		RES.. 200 OHM 5% 1/8W	ALLEN BRAD	RC05GF201J	
R 24	1	616-02-20000		RES,2K 5% 1/4W	ALLEN BRAD	RC07GF202J	
R 25	1	999-01-00015	7083	RES,*FREQ/VAR*			
R 26	1	616-02-20000		RES,2K 5% 1/4W	ALLEN BRAD	RC07GF202J	
R 27	1	620-02-20009		RES.. 200 OHM 5% 1/8W	ALLEN BRAD	RC05GF201J	
R 28	1	999-02-00013	7083	RES,DEV/VAR			
R 29	1	999-01-00016	7083	RES,*FREQ/VAR*			
R 30	1	999-02-00014	7083	RES,DEV/VAR			
R 31	1	999-02-00015	7083	RES,DEV/VAR			
R 32	1	999-02-00016	7083	RES,DEV/VAR			
R 33	1	999-01-00017	7083	RES*FREQ VAR*			
R 34	1	999-02-00018	7083	RES,DEV/VAR			
R 35	1	999-02-00019	7083	RES,DEV/VAR			
R 36	1	616-02-20000		RES,2K 5% 1/4W	ALLEN BRAD	RC07GF202J	
R 37	1	616-02-20009		RES,200 OHM 5% 1/4W	ALLEN BRAD	RC07GF201J	
R 38	1	616-02-20000		RES,2K 5% 1/4W	ALLEN BRAD	RC07GF202J	
R 39	1	620-02-20009		RES.. 200 OHM 5% 1/8W	ALLEN BRAD	RC05GF201J	
R 40	1	616-02-10000		RES,1K 5% 1/4W	ALLEN BRAD	RC07GF102J	
R 41	1	616-02-75009		RES,750 OHM 5% 1/4W	ALLEN BRAD	RC07GF751J	
R 42	1	616-02-75009		RES,750 OHM 5% 1/4W	ALLEN BRAD	RC07GF751J	
R 43	1	999-02-00020	7083	RES,DEV/VAR			
R 44	1	999-02-00021	7083	RES,DEV/VAR			
R 45	1	616-02-01009		RES,10 OHM 5% 1/4W	ALLEN BRAD	RC07GF100J	
REF 1	1	905-04-00002	9500-1	SPEC,COMPONENT SPACING	EMR	905-04-00002	
REF 2	1	905-01-00526	7079	SCHEMATIC,INPUT FILTER	EMR	905-01-00526	
REF 3	1	905-05-00177	7083	VARIABLE CHART	EMR	905-05-00177	
REF 4	1	905-05-00283	16768	VARIABLE CHART DEV.	EMR	905-05-00283	
REF 5	1	905-05-00284	16769	VARIABLE CHART DEV.	EMR	905-05-00284	

FIRST USAGE MODEL 4180-01

E M R - T E L E M E T R Y

PARTS LIST 7087 REV DATE 09/10/69 REV LTR E

LIST TITLE PWA,LOW PASS CHGE CONT NO. CODE IDENT SHT 1 OF 1
PART NO. 205-89-00687 ECO 37623 06141 CKD BY

ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER	USAGE
1	1	204-89-00272	7158	PWB,LOW PASS OUTPUT FLTR	EMR	204-89-00272	
2	1	273-02-00003		WASHER,#2, FLT ST STL	PRCMT OPTION	MS15795-802	
3	1	229-02-00065		SCREW,2-56X1/4 PAN HD	PRCMT OPTION	MS51957-3	* P
4	5	065-98-00012		CONT,PCB MOUNT RECEPTACLE	AMP	85861-4	
5	AR	276-99-00008	619-22	WIRE,#22,BUSS,SOLID	EMR	276-99-00008	
C 1	1	999-01-00003	17647/16738	CAP.,FREQ/VAR			
C 2	1	999-01-00004	17647/16738	CAP.,FREQ/VAR			
C 3	1	999-01-00005	17647/16738	CAP.,FREQ/VAR			
C 4	1	304-00-00000		CAP.,*TEST/VAR*			
C 5	1	301-13-10002		CAP, .1UF 20% 50V LS.200	MML 48	8131-050-651-104M/MML	
L 1	1	999-01-00001	17647/16738	L,FREQ/VAR			
L 2	1	999-01-00002	17647/16738	L,FREQ/VAR			
REF 1	1	905-04-00002	9500-1	SPEC,COMPONENT SPACING	EMR	905-04-00002	
REF 2	1	905-01-00525	7159	SCHEMATIC,L.P.O.F.	EMR	905-01-00525	
REF 3	1	905-05-00176	17647	VARIABLE CHART, CONSTANT	EMR	905-05-00176	
REF 4	1	905-05-00144	16289	VARIABLE CHART	EMR	905-05-00144	
REF 5	1	905-05-00179	16738	VARIABLE CHART, CONSTANT	EMR	905-05-00179	
REF 6	1	999-02-00001	16289	VARIABLE CHART			

FIRST USAGE MODEL 4187-01

Table 6-2. Recommended Spares List

PART DESCRIPTION	EMR STOCK NO.	VENDOR NAME	VENDOR PART NO.	TQ	RS	PRICE
EMR MODEL 4180-01 HIGH FREQUENCY DISCRIMINATOR						
PIN CONTACT	065-98-00009	Amphenol	86093-4	12	2	
SOCKET CONTACT	065-98-00012	Amphenol	85861-4	12	2	
DIODE	088-10-41480	JEDEC	1N4148	6	1	
FUSE, Slo-Blo, 1/4 Amp	120-98-00017	Littelfuse	313.250	2	1	
FUSE, Micro, 1/2 Amp 125V	120-98-00037	Littelfuse	273.500	1	1	
TRANSISTOR	263-10-32510	JEDEC	2N3251	7	1	
TRANSISTOR, NPN VHF/UHF Ampl	263-10-39330	JEDEC	2N3933	22	2	
CAPACITOR, .1 Mf ±20%, 50V	301-13-10002	Erie	8131-050-651 104M	25	2	
CAPACITOR, 1.0 Mf ±20%, 35V	336-23-10003	Spec	601	5	1	

Table 6-3. Vendor List

ABBREV.	VENDOR NAME AND ADDRESS
ALCO	Alco Electronics Manufacturing Co., Lawrence, Mass.
ALLEN BRAD	Allen-Bradley Co., Milwaukee, Wis.
ALPHLEX	Alpha Wire Corp., Elizabeth, N. Y.
AMATHOM	Amathom Electronic Hdwr. Co., Inc., New Rochelle, N. Y.
AMER SEALANT	American Sealants Co., Hartford, Conn.
AMPEREX	Amperex Electronic Co., Hicksville, N. Y.
AMPH BORG	Amphenol Corp., Broadview, Ill.
AMPHENOL	Amphenol Corp., Los Gatos, Calif.
AMP INC.	Amp, Inc., Harrisburg, Pa.
BECK INSTR	Beckman Instruments, Inc., Fullerton, Calif.
BECKMAN	Beckman Instruments, Inc., Fullerton, Calif.
BIRNBACH	Birnbach Radio Co., Inc., New York, N. Y.
BURNDY	Burndy Corp., Norwalk, Conn.
BOURNS	Bourns Inc., Riverside, Calif.
CARR FAST	Carr Fastener Co., Cambridge, Mass.
CHI MIN LAMP	Chicago Miniature Lamp Works, Chicago, Ill.
C & K	C & K Components, Inc., Newton, Mass.
CKT STRU	Circuit Structures Lab., Santa Ana, Calif.
CINCH	Cinch Mfg. Co., Chicago, Ill.
CLAROSTAT	Clarostat Mfg. Co., Dover, N. H.
CONTINENTAL	Continental Connector Corp., Woodside, N. Y.
CTS	CTS Corp., Elkhart, Ind.
DEL BLINN	Delbert/Blinn Co., Pomona, Calif.

Table 6-3 (Cont'd.). Vendor List

ABBREV.	VENDOR NAME AND ADDRESS
EECO	Engineered Electronics Co., Inc., Santa Ana, Calif.
E.F. JOHNSON	E.F. Johnson Co., Waseca, Minn.
ELCO	Elco Corp., Willow Grove, Pa.
ELDEMA	Eldema Corp., Compton, Calif.
EMR-T	EMR-Telemetry, Div. of Weston Instruments, Inc., Sarasota, Florida
ERIE	Erie Technological Products, Inc., Erie, Pa.
FCH	Fairchild Camera and Instrument Corp., Mountain View, Calif.
FERROX-CUBE	Ferroxcube Corp. of America, Saugerties, Calif.
GEN CEMENT	General Cement, Div. of Textron, Inc., Rockford, Ill.
G.E.	General Electric Co., Miniature Lamp Dept., Cleveland, Ohio
GRAYHILL	Grayhill, Inc., La Orange, Ill.
HARTWELL	Hartwell Corp., Los Angeles, Calif.
HATHAWAY INS.	Hathaway Instruments, Inc., Denver, Colorado
H.H. SMITH	Herman H. Smith, Inc., Brooklyn, N.Y.
HUBBELL	Harvey Hubbel, Inc., Bridgeport, Conn.
IERC	International Electronic Research Corp., Burbank, Calif.
IRC	IRC, Inc., Burlington, Iowa
JEDEC	
LITTELFUSE	Littelfuse, Inc., Des Plaines, Ill.
MILTON ROSS	Milton Ross Metals Co., Southampton, Pa.
MOT	Motorola Semiconductor Products, Inc., Phoenix, Ariz.

Table 6-3 (Cont'd.). Vendor List

ABBREV.	VENDOR NAME AND ADDRESS
NSC	National Semiconductor Corp., Santa Clara, Calif.
PENDAR	Clare-Pendar, Inc., Post Falls, Idaho
QVL	Qualified Vendor List
RCA	Radio Corp. of America, Somerville, N.J.
RIEDON	Riedon Avionics, Inc., Van Nuys, Calif.
ROSS MFG.	Ross Mfg. Co., Cleveland, Ohio
ROTRON MFG.	Rotron Manufacturing Co., Inc., Woodstock, N.Y.
SCANBE	Scanbe Mfg. Corp., Monterey Park, Calif.
SEALECTRO	Sealectro Corp., Mamaroneck, N.Y.
SEASTROM	Seastrom Mfg. Co., Glendale, Calif.
SHAKEPROOF	Shakeproof, Div. of Illinois Tool Works, Inc., Elgin, Ill.
SIG	Signetics Corp., Sunnyvale, Calif.
SOUTHCO	South Coast Co., Newport Beach, Calif.
SPEC (EMR-T)	EMR-Telemetry, Div. of Weston Instruments, Inc., Sarasota, Fla.
SPRAGUE	Sprague Electric Corp., Bristol, Conn.
SUPERIOR	Superior Electric Co., Bristol, Conn.
SYL	Sylvania Electric Products, Inc., Semiconductor Div., Woburn, Mass.
T.I.	Texas Instrument, Inc., Dallas, Texas
USECO	Useco, Inc., Mt. Vernon, N.Y.
WABCO	Westinghouse Air Brake Co. Signal and Communications, Div., Pittsburgh, Pa.
WAKEFIELD	Wakefield Engineering, Inc., Wakefield, Mass.

Table 6-4. Customer Provisioning Questionnaire

1. Equipment to be spared
   Model No.(s):_____
   Serial No.(s):_____

2. Number of equipments to be spared in each location_____

3. Operating time and cycle:_____hours/day,_____days/week.

4. Operating Environment:

   A. Temperature:_____
   B. Humidity:_____
   C. Altitude:_____
   D. Shock and Vibration:_____

5. Non-operating Environment:_____

   A. Temperature:_____
   B. Humidity:_____
   C. Altitude:_____

6. Desired probability of being able to spare from complement _____percent for_____months.

7. Can usage permit troubleshooting to parts level when a failure occurs?_____

8. What spare assemblies do you have that are used in this Model Equipment?_____

9. Do you wish us to exclude the EMR warranty period?_____

MP MASTER
MA20092